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FOUNDRY TRADE JOURNAL

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A Newly-born Industry

We imagine that, like ourselves, readers must have been astounded at the mushroom growth of Finnish foundry industry. When Mr. Autere, the author of the article on this subject printed elsewhere in this issue, attributed this phenomenal growth to the reparations which were paid to Russia, our interest was aroused. We were fortunate in obtaining Mr. L. Spirer's recent book on "The Challenge of Scandinavia"*; here we learnt that the growth of the engineering industry—and with it of course foundry production—is even more remarkable than appears in Mr. Autere's article. Because of the annexation of a slice of Finnish territory, no fewer than 477,000 refugees from these areas (roughly a tenth of the existing population) had to be housed, fed and given employment. War reparations did not take the form of forestry products (which Finland was well able to supply) but engineering plant—over a period of six years. This, the country was ill-equipped to produce but somehow or other the harsh conditions were complied with to the day. Any lateness in delivery was to have been associated with the terms traditionally associated with money-lending.

Amongst the material to be delivered were 623 vessels, 30 complete factories together with power-stations, 700 locomotives of various types, 80 turbo-generators, 52,000 electric motors and gas engines and 1,000 "transportable power-stations." The task was finished on September 9, 1953, but it still left the Finns with economic problems—they had only one big customer who was not particularly interested in Finland's traditional exports. Here the UK stepped into the breach and became once again Finland's major customer. The Russians, however, to sustain their economic grip decided that they would also buy forestry products and, moreover, decided to pay in convertible currency. This has enabled Finland to receive coal from Poland and oil from Rumania, so as to retain for the Eastern bloc a valuable source of supply of engineering plant.

Very fortunately, the Finnish population does not seem to be too much disturbed by their economic dependence on Russia. Though much of Finnish industry is nationalized, this is not because the Finns are so minded but simply because private enterprise cannot find the necessary capital for large-scale industrial construction, though the concerns dealing in forestry products have supplied substantial funds. From Mr. Autere's description it does seem worth while for visitors to the Stockholm convention to include this "new foundry country" in their tour of inspection.

* Published by Robert Hale, Limited, 63, Old Brompton Road, London, S.W.7.

PETER B. HIGGINS

Featuring . . . .

P. B. HIGGINS, A.C.A., F.I.D., F.B.I.M., M.I.Prod.E., M.I.B.F., M.Inst.M.

MR. PETER B. HIGGINS, affectionately known throughout the industry as "Peter," became president of the Association of Bronze & Brass Founders on April 4. His father—the late Mr. Harold Higgins—was one of a group of leading members of the industry who formed the Association in 1940, and became a member of its first Council. Mr. P. B. Higgins was appointed member of the ABBF technical committee on its creation and on the death of his father, was appointed to the Council in 1943. He continued to serve on the committee until 1946. For the past three years, he has been one of the representatives of the Association on the Joint Standing Committee for Safety, Health and Welfare Conditions in Non-ferrous Foundries.

Mr. Higgins was educated at Roundhay School, and after qualifying as a chartered accountant, obtained practical training and experience in engineering and metallurgy both with the firm of Yorkshire Engineering Supplies, Limited, and at Leyland Motors, Limited. At Yorkshire Engineering Supplies, Limited, he subsequently became planning engineer for the foundries and machine shops, and later, production manager. Due to the untimely death of his father in 1943, he was called upon at the early age of 28 to shoulder the entire responsibility of the practical management of the firm. Very shortly afterwards he was appointed a director and secretary of the company, and in 1950, on the death of Mr. H. Carr Walker, the founder of the firm, Mr. Higgins became managing director. Some years ago Mr. Higgins introduced to the firm the idea of developing the "Eatonia" water-cooled process—which has been known in this country since the first world war—in conjunction with the known methods of continuous casting, thereby enabling bars and tubes to be produced in 10- to 12-ft. lengths. The accuracy of such bars and tubes enables them to be fed through collets and feed fingers of automatic machines. Under his guidance also, the firm has pioneered considerable development of shell moulding, and now operates its Huddersfield foundry entirely on this process.

In addition to being managing director of Yorkshire Engineering Supplies, Limited, he is a director of George Beardsley & Company, Limited; Specialloid, Limited; and Aero Piston Ring Company, Limited. More recently, he joined the board of Jonas Woodhead & Sons, Limited, and became its deputy chairman.

He is a member of the Institute of British Foundrymen, a founder member of the British Institute of Management, a member of the Institution of Production Engineers and of the Institute of Metals, and a fellow of the Institute of Directors. He is also a life member of the Royal Aero Club and the Yorkshire County Cricket Club, but his present hobby is golf.

Correspondence

STEELFOUNDRY MOULDING MATERIALS

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—The writer has read with interest the paper by J. M. Middleton, A.MET., on steelfoundry moulding materials (JOURNAL, April 18, 1957), and would seriously contest the statement on page 471 that CO_2-Process sands are not re-usable. That these sands can be re-used has been proved time and again by Mr. A. J. Perrins of Wrexham, and numerous other founders in this country.—Yours, etc.,

T. HORTON KAY,
Managing Director.

Lambeth & Company (Liverpool), Limited.
April 18, 1957.

NSMP New Members

At a recent meeting of the National Society of Master Patternmakers, held in Leicester, the following were admitted to membership: W. R. Southwell (Designs), Limited, of Croydon; G. M. Dickinson, of Stockton-on-Tees; Northern Pattern Making Company, Limited, Gateshead-on-Tyne; T. W. Turner, Stockton-on-Tees; G. Robertson (Woodworkers), Limited, and Emmerson-Hickson, Limited, the last two of Newcastle-on-Tyne.

(The annual meeting of the Society is to be held on May 8 at 11.45 a.m. in the Grand Hotel, Manchester. It will be followed by luncheon (for those members who ask the secretaries to reserve places) at 1.30 p.m.)

THE SIR JOHN CASS COLLEGE, Jewry Street, Aldgate, London, E.C.3, announce a course of four lectures on "Trade Marks" to be delivered by Mr. Anthony Walton, M.A., B.C.L.(OXON), on Thursday evenings at 6 p.m., commencing May 9. A course of six lectures on "Fuel Oils" is also announced. These are to be held on Thursday afternoons at 3.30 p.m., beginning on May 2.

Shipbuilders' £6,000,000 Extensions

Capital expenditure authorized and under consideration is estimated to involve about £6,000,000 over the next four or five years for Swan, Hunter, & Wigham Richardson, Limited, Wallsend shipbuilders and engineers. In the statement of the late chairman, Mr. J. W. Elliott, completed before his death last month, it is revealed that the group spent £1,480,764—equivalent to 84 per cent. of the total net profit—on additions to buildings, plant, etc., in 1956.

Partly due to increased costs and also due to necessary revision of ideas to accommodate the recent increase in tanker size, outlay considerably exceeds that anticipated a year ago. The group already has on its order-book ships up to 60,000 tons d.w. Providing increased steel supplies are available the directors expect that the construction of new ships will be accelerated. Increased accommodation for fitting out afloat means greatly increased expenditure, and the board is continuing to adopt a conservative dividend policy.

Machine-tool Orders

Record export orders were booked by British machine-tool manufacturers in January. The total value of export orders received was £2,530,000, compared with £1,670,000 in December and £1,870,000 in January, 1956. Home orders at £4,960,000 recovered from the low level of £4,120,000 in December, but they were still well below the monthly average of £6,260,000 in 1955 and the peak quarterly figure of £6,540,000 in the first quarter of last year.

The rate of deliveries during the month also reached a new record value of £8,720,000, against £7,650,000 in December and £6,400,000 in January, 1956. Both home and export deliveries were at the highest rate yet achieved. Home deliveries were valued at £6,640,000, against £4,960,000 in January, 1956. The value of outstanding home orders has fallen from a peak of £81,860,000 at the end of July, 1956, to £73,510,000 at the end of January, 1957.

Commemorative Fireback Casting

In May, 1660, *Charles II returned to be King of England and the Stuart dynasty was restored. The fireback shown in the accompanying illustration was cast to commemorate this event. The Royal Oak of Boscobel (Staffordshire), in which Charles had hidden after the Battle of Worcester, was used as the* motif *for the pattern. Firebacks are amongst the oldest castings to be traced in this country, a number emanating from the early Sussex founders. It is sometimes difficult, however, to identify genuine antiques from copies produced over the years, using the originals as patterns.*

The Foundry Industry of Finland

*By Eugen Autere**

The following review of the Finnish foundry industry is of special significance vis à vis *the siting in Stockholm of the International Foundry Congress, to be held during September. Arrangements for the Congress have been made by the foundry organizations of Norway, Sweden, Denmark and Finland, and the itinerary includes a visit to Finland. Outlined in what follows are the economic, raw-material and labour problems that exist to-day in Finland, a country which has had to make rapid recovery from the severe destruction that occurred during the last war. The Author concludes with detailed notes on some of the larger foundries that are at present in operation.*

The total area of Finland is 130,085 sq. mls., of which nearly 10 per cent consists of lakes and waterways and 60 per cent. forests. The number of inhabitants is in excess of 4,000,000, and approximately one third of these live in the coastal regions, the bulk of the population reside in the 35 towns and 30 market towns.

Engineering Industry

The capacity of the engineering industry of Finland has grown by about 100 per cent. since the second world war. One reason for this may well be the war reparations which had to be made to the USSR during 1944 to 1952. The total value of these reparations, according to the original peace agreement in 1944, was 300 million gold dollars for goods deliverable during six years but it was later reduced to $225 millions. About three quarters of this were products of the metalworking industry such as ships, machines, electrical cables, etc. The engineering and foundry industry was therefore forced to undertake considerable expansions. However, this involved many difficulties owing to the unique structure of the Finnish export industry, which overwhelmingly consists of timber, and its by-products, the cellulose industry and paper.

The development of the engineering and foundry industry can be visualized from the following statistics:—

Year.	Total number of people in the engineering industry.	Consumption of pig-iron
1938	56,000 men	44,000 tons
1955	90,000 men	107,000 tons
	Steel castings production.	Steel production.
1938	3,900 tons	72,500 tons
1955	11,500 tons	175,000 tons

The total number of foundries in Finland is estimated to be about 150, however, in addition there are numerous other smaller non-ferrous foundries of very limited capacity. Two foundries have an annual production capacity in excess of 15,000 tons; 5 of between 5,000 and 15,000 tons; 17 between 1,000 and 5,000 tons, the remainder having an annual production below 1,000 tons of finished castings.

Four foundries are producing steel castings their total output being about 11,500 tons in 1955, two foundries cast 1,700 tons of malleable iron, and one makes about 1,200 tons of nodular cast-iron annually.

* Eugen Autere is foundry manager of the Högfors works, Finland.

Metal Resources and Raw Materials

At present there is only one iron-ore mine, Otanmäki Oy, in operation in Finland, the ore available from this mine is, however, not used for making foundry pig-irons, for its low phosphorus and high vanadium and titanium content is better suited as raw-material for steel production; the annual production of iron ore is 750,000 tons. The ore, containing about 32 per cent. magnetite, is submitted to magnetic separation and flotation and the principal products obtained are magnetite and ilmenite concentrates, for the magnetite concentrate, which contains most of the vanadium; a new method has been developed for the separation of this constituent. After vanadium separation the rest of the concentrate, called pellets, as well as the ilmenite concentrate, which contains about 44 per cent. TiO_2, are exported to different countries in Europe.

Pig-iron

The only blast furnace of Finland (Fig. 1) is situated in the south, near Turku and is part of the large iron and steel works, Oy Vuoksenniska Ab. Most of the ore for this furnace is imported from Sweden. The annual production is 85,000 tons of high quality hematite- and phosphoric-irons for foundry purposes. In addition, Oy Wuoksenniska is producing about 20,000 tons of electrically-melted pig-iron at their Imatra works and some other smaller producers make about 15,000 tons annually. The total production of pig-iron in Finland in 1955 was about 115,000 tons. From this tonnage, part was exported, but the same amount of special irons, such as cold-blast charcoal iron, Norwegian Vantit-iron and ferro-alloys, was imported.

Copper

The Outokumpu copper-mine being one of the richest deposits in Europe enables Finland to be self-supporting as regards copper, the refining of the ore from this mine has been highly developed, production being approximately 600,000 tons per annum. The ore is dressed by flotation and the concentrates are transported to the plants at Harjavalta and Pori, where they are smelted and refined. For the melting of the copper concentrate Finnish metallurgists have developed a method which is claimed to be unique; melting being carried out with the heat of combustion of the sulphur in the concentrate without any additional fuel. The

FIG. 1.—*Aerial view of the Vuoksenniska company's blast furnace at Turku; this furnace produces 250 to 300 tons of foundry pig-iron per day.*

production of Outokumpu company amounted to 22,000 tons of cathode copper in 1956, of which about 8,000 tons were exported and the remainder was used by Finnish cable, electric and foundry industries. Most of the alloying metals, which are required for copper alloys, are imported, however, it is interesting to note that Outokumpu Oy has opened up a new zinc-mine at Vihanti but its principal product, zinc concentrate, which contains 52 per cent. Zn, has not so far been refined in Finland. In addition to Outokumpu and Vihanti the following mines, owned by Outokumpu Oy, are in operation: Ylöjärvi, Aijala and Metsämonttu, which all are producing small quantities of copper, zinc and lead-concentrates.

Coke and Oil

As there are no coal-mines or oil wells in Finland these important fuels have to be imported, coal and coke are mostly imported from the UK, Germany, Belgium, Poland and USSR. The countries of origin being frequently dictated by the currency situation and trade agreements with the result that the quality has not always been satisfactory, especially as to the size of cupola coke. In recent years the use of high-carbon coke has noticeably increased. Oils, naphtha and gasoline are all imported; however, an oil-refinery is now under construction at Naantali, and it is expected that the operation of this plant will considerably reduce the value of refined-oil imports.

Electric Power

After the second world war Finland lost about one third of the whole hydroelectric power production to the USSR; this has resulted in a serious shortage of power in the years 1947-1948. The construction of new hydroelectric power-plants was started immediately after the war in North Finland, where considerable unexploited natural-power resources were available. At present some of these new power plants are in operation and the generated power, which in 1939 was 2.7 milliard kwh. increased in 1955 to a total amount of 6.6 milliard. It is estimated that the total electric-power production in the future, when all the hydroelectric-reserves are exploited, will be about 17 milliard kwh.

FIG. 2. — *Combined iron and steel foundry at Pori.*

Foundry Sands

Sand deposits suitable for moulding purpose are very limited in Finland, there are no natural-bonded sands and the only big and useful quartz-sand deposit is situated at Viasvesi near the town of Pori. Most of the large iron foundries are receiving their sands from this deposit. The Viasvesi sands are

very uniform and the SiO_2-content varies from 88 to 93 per cent.; on a grain-size basis the Viasvesi sands may be divided into three groups, as set out in Table I.

TABLE I.—*Grain Size of Finnish Silica Sands.*

ASTM Sieve Number.	Viasvesi sands.		
	Fine.	Medium.	Coarse.
12	—	—	—
20	—	—	—
30	Under 1.0	Under 1.0	Under 2.0
50	7.0	11.0	84.0
70	15.0	57.0	13.0
140	57.0	25.0	Under 1.0
270	19.0	6.0	—
Pan	1.0	Under 1.0	—

Viasvesi sands originate from the sea-bed but the grain shape is not so rounded as the original deposits, sub-angular grain-shape being more typical for the Viasvesi sands, the clay content being less than 1.0 per cent. High-refractory quartz-sands, which are suitable for steel foundries, are imported from Central Europe, synthetic moulding-sands are normally utilized in the foundries. The most common bond-clay is Wyoming bentonite and for a carbonous material, coal-dust, pelleted pitch and wood-flour are added.

In the production of core sands the Viasvesi sands are commonly used, however, some foundries have their own local sources, the products of cellulose industry, such as sulphite-lye and tall-oil are in extensive use for core binders but linseed-oil based binders, dextrine and starch-binders are also very common. Resin core-binders are, not yet, very much used in the country owing to their high prices, at the moment there is only one foundry, which in the larger range is operating with resin core-binders. The Carbon-dioxide Process is rapidly gaining popularity and is being used in many foundries.

Refractories and Fluxes

There are no fireclay deposits of really good quality in Finland and most of the raw materials, which are needed for the manufacture of firebricks and cupola patching materials have to be imported. The main Finnish refractory works are Kupittaan Savi Oy, Wärtsilä-Yhtymä Oy, Arabia, and Keramia Oy, they are able to satisfy the demand for ordinary firebricks, most of the silica-, magnesite- and chromite bricks, as well as the major part of cupola patching-material, being imported. Small quartz deposits occur around the country but most of them are of no importance for use by the foundry industry. Supplies of limestone and dolomitic stone for fluxing materials are closely situated to all the major industrial centres and there is no difficulty in obtaining these materials.

FOUNDRY INDUSTRY

The major proportion of the foundry industry is located in South Finland in association with the engineering centres, the production of the largest foundries is centred around sanitary and household castings, heating boilers, radiators, water and soil pipes, building accessories, etc. As to the production of the jobbing foundries the major outlet is for castings for large paper-making machines, such as rolls and dryers, which are manufactured in many works. There are no motor-car castings made in the country, however, one factory, Valmet Oy, is manufacturing tractors at the plant at Jyväskylä. Steel foundries are producing a wide selection of parts for the engineering industry, heat- and corrosion-resisting castings for the cellulose and chemical industry and wear-resisting manganese-steel castings for the mining industry.

As most of the large foundries have been built or rebuilt since the war their buildings are spacious, light and well ventilated, owing to the severe winter in Finland the buildings usually are of heavy reinforced-concrete construction. Many of the large foundries have wholly mechanized sand-preparing systems, the mixing being normally carried out in Simpson mixers or in Speedmullers, the prepared sand is transported to the moulder's hopper by means of elevators and conveyor belts. The gravity roller conveyor system is often utilized,

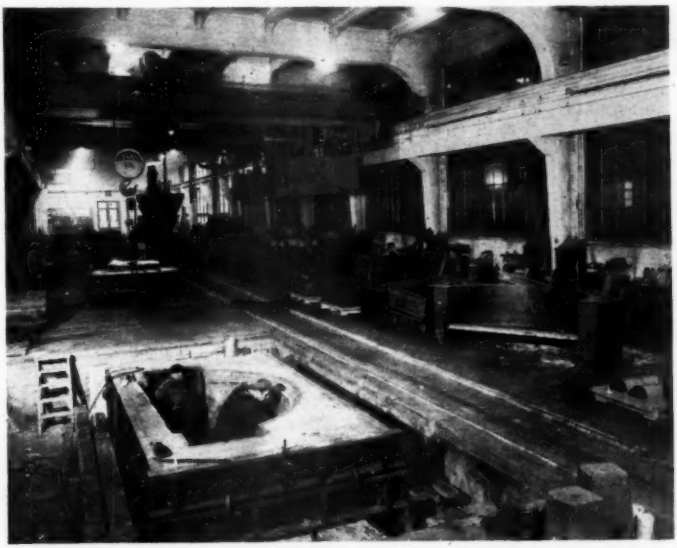


FIG. 3.—*General view of the moulding shops of the Lokomo Oy foundry. In the foreground, workmen can be seen finishing a large mould. Ramming is carried out by the motive-type Sandslinger shown in the background.*

FIG. 4.—*Bath moulding by means of an impeller-rammer at the Högfors plant.*

but power-driven mould-conveyors are also met with in some foundries. Moulding machines that are used, range from hand-press to modern semi-automatic jolt-squeeze rollover, especially common are the Jähle-turnover machines in which the cope and drag are usually rammed at the same time, twelve jobbing foundries are using impeller rammers for moulding. The greatest advance in mechanization, in process-control and adoption of modern melting and moulding methods has been made in repetition-production foundries. Some of the large foundries are employing metallurgists and technical staff for supervision and have laboratories for routine analysis and for research work. There are altogether about 15 foundries in Finland which are well planned and equipped with modern machinery. The smaller foundries are only partly mechanized or are operating entirely without any mechanization. Figs. 2 to 11 show some of the plant installations made in post-war years.

Melting Methods

Cupolas are the most commonly used melting furnaces for cast-iron production; in recent years the hot-blast cupolas have been progressively applied and some foundries in Finland have already fitted their cupolas with hot-blast equipment. Refractories employed in the Finnish cupolas are entirely acid, no basic-lined cupolas being used. Many of the foundries are using modern mechanical-charging equipments for their melting plant. Electric furnaces are used for melting cast iron and both arc- and induction-furnaces are most favoured, steel foundries are usually equipped with direct-arc furnaces but some high-frequency induction-furnaces and Siemens-Martins-furnaces are in use. Non-ferrous melting is mainly effected in crucible furnaces, usually oil or coke fired.

Högfors Works

Högforsin Tehdas (Högfors Works) is owned by a large paper-mill concern, Oy Kymmene Ab, the foundry is one of the oldest in the country and is situated in Karkkila about 50 miles northwest of Helsinki. In addition to the foundry there are machine and assembly shops and a large vitreous-enamelling department. The whole plant employs 1,400 workers, 500 being in the foundry. The production amounts to 16,000 tons of finished castings per annum; the factory has specialized in the quantity production of boilers, radiators, sanitary and household-castings, baths, building accessories, cookers, etc. The production plant of the factory has been almost entirely modernized since the war and with the new buildings the foundry now covers 7.5 acres (*i.e.*, 324,000 sq. ft.).

The daily meltings are about 120 tons. Two cupolas of 1,250 mm. (50in.) internal diameter, are fitted with a Schack-type recuperator, this pre-heats the blast up to a temperature of 450 deg. C.; the cupolas are externally water-cooled.

The charge is composed of 36 per cent. pig-iron (Si 2.5 per cent), 36 per cent returns, 12 per cent. bought cast-iron scrap, 12 per cent. steel scrap and 4 per cent. high-silicon pig-iron (15 per cent. Si). Coke to iron ratio employed is 1 : 10. The temperature of iron at the spout varies from 1,480 to 1,550 deg. C. The carburization of the steel scrap occurs very effectively and composition of the melt iron varies between C 3.3 to 3.5; Si 2.1 to 2.2; Mn 0.7 to 0.8; P 0.3 to 0.4 and S 0.06 to 0.1 per cent. This iron is used for pouring of the boiler-sections and thin castings. In order to even out the composition and temperature fluctuations, and to have a large reservoir of the metal, the cupolas are provided with a tilting receiver of 10 tons capacity, this receiver, which may be preheated by oil burner, is made by Schinke in Germany.

There are four different fully-mechanized moulding systems. In system I, boiler sections are moulded on large Zimmermann jolt/squeeze pin-lift machines. System II includes 48 pinlift and turnover moulding-machines of various types and sizes. Production from the 17 by 14 in. moulding boxes varies from 200-300 per day per operator, both systems (I and II) being equipped with gravity roller-conveyors. System III is provided with power-driven conveyors, for knocking-out the moulds, there are two fully-automatic shake-out devices. In the fourth system cast baths are made by impeller-rammers, a group of 12 men producing 100 baths in eight hours.

The plant suffers from a shortage of foundry workers; in order to increase the production of the plant, plans are in hand to mechanize the principal operating cycles as far as possible. As a first step automatic shake-out devices were installed, these have been operating successfully for about two years.

Moulding sand is bought from Viasvesi, bentonite coal-dust, pelleted pitch and wood-flour are added to the moulding sand to prevent scabbing. Core-sand quarried from a nearby sandpit is of unsatisfactory quality. Large cores for boiler sections are made by baking. The production of small cores is effected in core-blowing machines of different types. The fitting shop is provided with modern mechanical impact-cleaning machines such as the WM-4 cleaning cabinet supplied by G. Fischer in Switzerland.

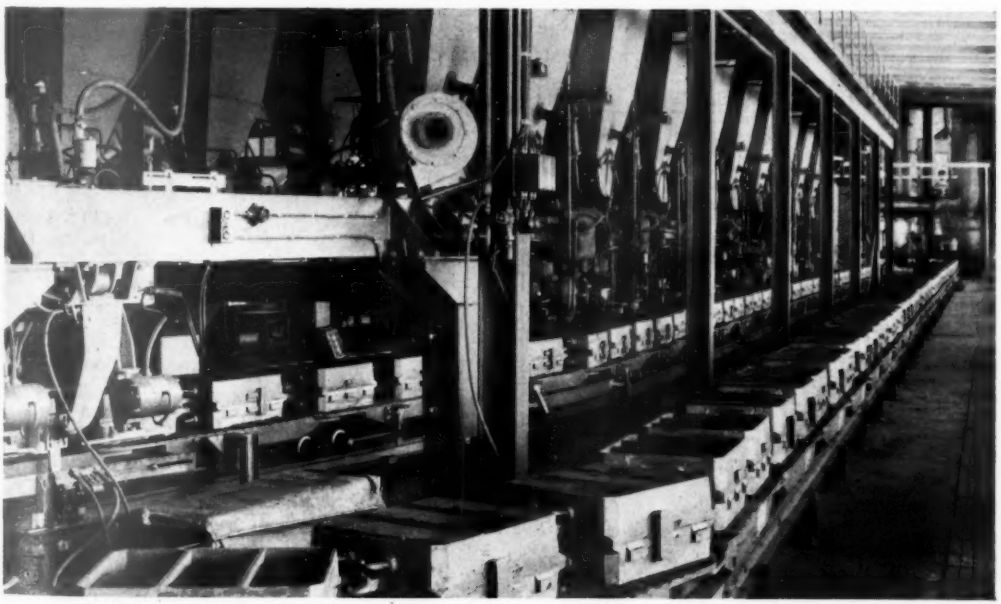
Porin Konepaja

The Porin Konepaja foundry is owned by a large paper and engineering concern, W. Rosenlew & Company and is situated in Pori, in association with the large engineering and assembly shops. The new foundry building, which covers 2.5 acres, is spacious and light and modern production plant has been installed. The range of manufacture includes 400 h.p. locomotives, agricultural machinery, wood-fired cookers and stoves, household castings and building accessories, in addition, the foundry is producing all the cast parts for refrigerators and washing machines, which are completed in the main engineering works. Much jobbing work is also undertaken; the total annual production amounts to 7,500 tons of cast iron and 500 tons of steel castings, whilst brass, bronze and silumin (alpax) castings are also produced; the foundry employs 370 workers.

The sand preparation, carried out by three Speedmullers, is semi-automatic, the moulding department being equipped with gravity roller-conveyors whilst for moulding there are 39 machines of the Osborn-, Jähle- and Zimmermann-types. The ramming of large moulds is effected by a

FIG. 6.—*Close-up of the automatic shake-out at the Högfors works.*

FIG. 5.—*One of the two moulding conveyors at the Högfors foundry; on the left can be seen an automatic shake-out device* (*see also* FIG. 6).



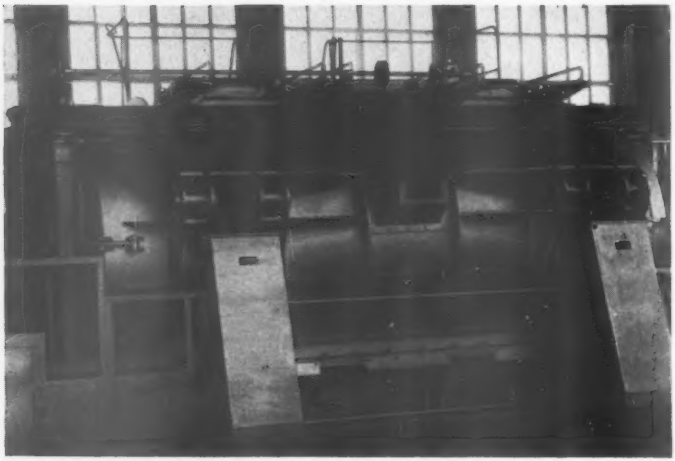


FIG. 7.—*Low-frequency induction-furnace at the Rautpohja foundry, with a melting capacity of 25 tons of grey iron.*

stationary Sandslinger, which is by Beardsley and Piper. The iron is melted in two hot-blast cupolas, which are fitted with a Schack recuperator, in addition there are two cold-blast cupolas of 7 tons capacity and two high-frequency induction-furnaces of 3 tons capacity with an electrical-power input of 900 kva.

The cleaning of bigger castings is carried out by means of a hydroblast plant, for the smaller castings several impact-cleaning machines have been installed. In addition to the foundry, there is a modern vitreous-enamelling plant for the household castings, cookers, refrigerators, etc.

Upo Oy, Lahti

Upo Oy, Lahti, annually produces 23,000 tons of finished castings mainly comprising centrifugally-cast pipes and some household castings and cast-iron fittings, some 300 workers are employed. For moulding there are 18 ordinary machines and one automatic - moulding machine of the Webac-type working with overhead sand hoppers, complete sand preparation and roller conveyors. The pouring of the pipes is effected in seven centrifugal - casting machines, the iron is melted in four cold-blast cupolas of 45 and 32 in. dia.

Kone ja Silta

The Kone ja Silta plant of Helsinki is a subsidiary of the Wärtsilä concern, which is the largest engineering firm in Finland and owns several plants in the country. The foundry produces castings for paper machinery and marine diesel and steam engines which amount to 2,500 tons of finished castings per annum. Ramming is carried out by means of an impeller-ramming machine of the Axman-type, sand preparation is semi-automatic. Metal is melted in cupolas, electric pig-iron is used as the main raw material, this is produced from scrap at one of the plants.

Lokomo Oy, Tampere

Lokomo Oy, Tampere, is a jobbing shop which has an annual production of 4,200 tons of finished steel castings and 4,000 tons of ingots for the company's own forging plant, and is the largest steel foundry in Finland, employing over 300 workers. Melting is effected in either a 6.5-ton Heroult-type arc-furnace, having a power input of 1,200 kw or a high - frequency induction furnace with a power input of 1,100 kw. The arc-furnace has a basic lining whilst the induction furnace is acid lined, the raw material for these is almost entirely composed of steel scrap.

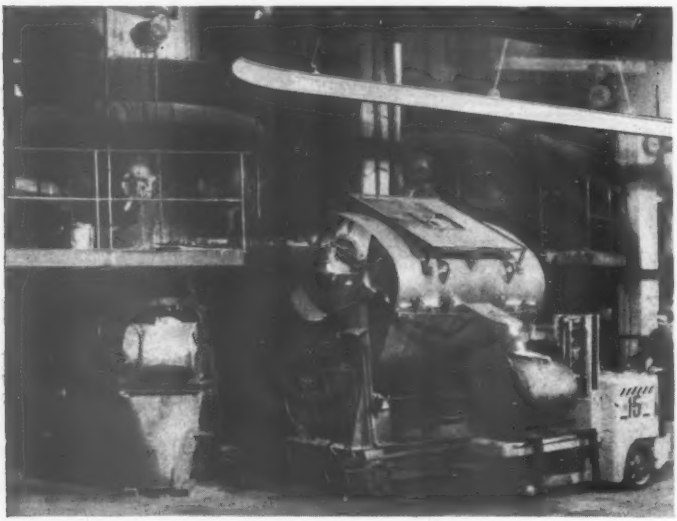


FIG. 8.—*Two 12 tons per hr. hot-blast cupolas at the Högfors works, with a ten-ton capacity mixer; metal is collected in barrel-type ladles mounted on battery-operated hoisting-platform trucks.*

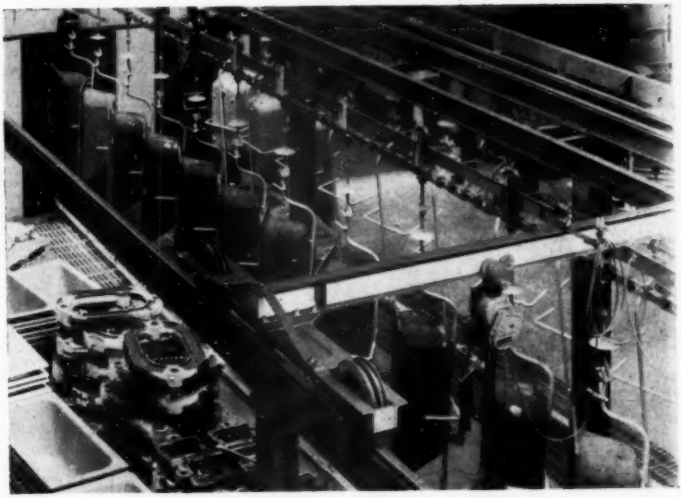


FIG. 9.—*Cleaning bath castings in a continuous airless shot-blast plant.*

Production comprises mainly steel castings for special requirements, including hardened steel castings for road-making ploughs, excavating machines and locomotives; acid-resisting and stainless-steel castings to meet the demand from the chemical and woodworking industry and for hydraulic turbines. Wear-resisting manganese-steel castings for machines for the mining industry and contractors and heat-resisting steel castings for the cement industry are also produced. Moulding is carried out by hand, using a Beardsley & Piper Sandslinger, and by a few moulding machines, green-sand moulding being normally used. The knock-out of the moulds is effected on mechanical shake-out units and fettling is carried out by means of pneumatic chisels and airless shot cleaning machines of the Fischer and Berger-types. The cutting of risers and runners is carried out by an oxyacetylene- and powder-cutting method.

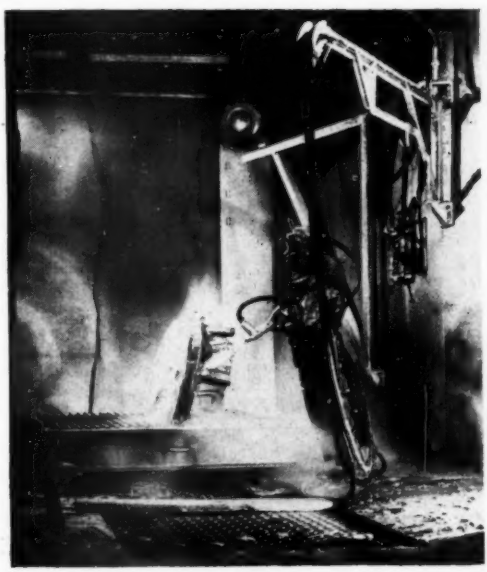
Valmet Oy, Rautpohja Foundry, Jyväskylä

Rautpohja is the central iron foundry of a state-owned metal-working concern; it is a typical jobbing foundry, the monthly delivery of castings is of the order of 800 tons, about half of which are machine moulded. In addition to hand moulding, the floor-moulding section uses impeller-rammers; about 300 men are employed. Some 60 per cent. of the castings produced are various types of grey cast-iron, the rest being ductile, whiteheart, malleable and white-iron castings. About half of the iron is melted in electric furnaces and half in cupolas. Besides crucible-type induction furnaces, the electric melting facilities include what is claimed to be the world's largest channel-type induction-furnace melting cast iron. The principal binder used for core sands is a synthetic resin, but in recent years, the CO_2-Process has been increasingly applied to the cores and moulds. The moulding is carried out in green sand, with the exception of the paper-machine rolls and dryers which are cast in dried moulds. The annealing of whiteheart-malleable iron is carried out in electrically-heated controlled-atmosphere batch-type furnaces.

Karhula Steel Foundry

Karhula, which is owned by a large woodworking concern A. Ahlström Oy, has an annual production of 3,000 tons of finished castings, including straight and alloyed steels, such as manganese-steels, austenitic- and martensitic-stainless steels. Moulding is carried out by a Beardsley & Piper's motive-type sandslinger and by moulding machines. In the core department there are two core-blowing machines of the Hansberg-type. Steel melting is effected in four Grönvall-type basic-lined arc-furnaces, which have capacities of 6, 4 and 1.5 tons respectively. The annealing of steel castings is carried out in two bell-furnaces with

FIG. 10.—*Steel castings being cleaned by Hydroblast at the Karhula steel foundry.*



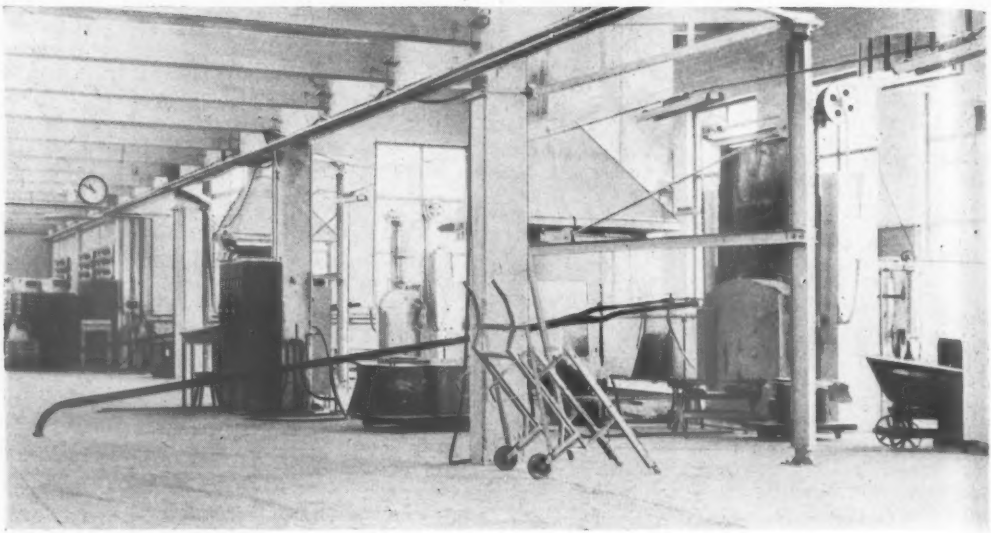


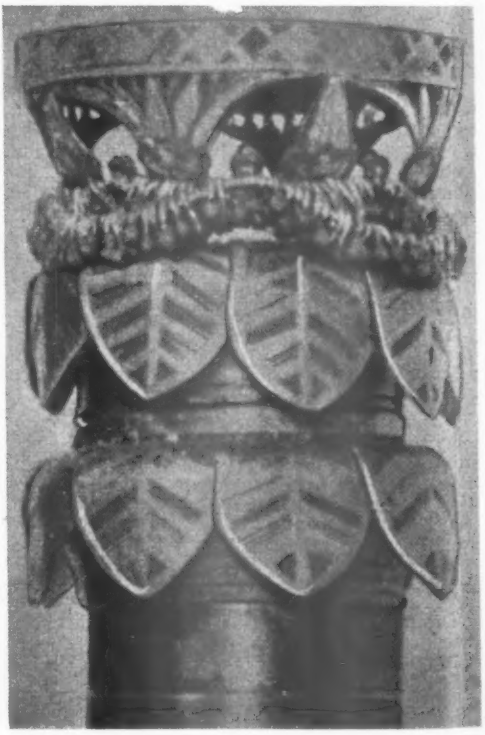
FIG. 11.—*Battery of 250-kw. electric enamelling furnaces at the Högfors works.*

electrical-power inputs of 420 and 250 kw. The cleaning shop is provided with Hydroblast equipments and with a G. Fischer-type airless shot cleaning machine.

Founding at Solomon's Temple

By C. J. Robb

A unique founder's job is provided by the two copper-alloy cast columns 27-ft. high and 6-ft. dia., which King Solomon had erected to flank the entrance of his wonderful Temple. These pillars were named Jachin and Boaz and their ornate capitals were called chapiters and served as braziers for incense oil, for they were set up to remind all who came to the holy place of the Exodus, "pillar of cloud by day" and "pillar of fire by night." From the biblical reading, one would conclude that these huge pillars were cast in one piece, but archaeological knowledge of the limitations of the founder's art at that period would suggest that they were made in sections in the form of rings, one resting on the other and perhaps rendered stable by a cedarwood framing within. Of the capitals it is written: "He made two chapiters of molten brass to set upon the tops of the pillars; the height of the one was five cubits. He also made net of checker-work and wreathes of chainwork; seven for the one capital and seven for the other capital. And the capitals were of lillywork, four cubits. And the pomegranates were in two-hundred in rows, round about upon each capital." Models (similar to that illustrated in the adjoining column) made according to biblical description and contemporary evidence, such as the pillar found at Megiddo before world war I, indicate that the founder of that time was a man of great skill as the florated enrichment and filigree work revealed a prime piece of the art of casting.



Control of Aluminium-alloy Melting Practice

Quality control in melting practice is often a sadly neglected factor in foundry practice, and the following paper details some of the overlooked considerations—such as improvements that can be effected in the final properties of aluminium alloys, by altering conditions that appertain during their melting. Among the factors that are dealt with are contamination from the melting crucible; gas absorption; time of holding at pouring temperatures and temperature control. The Author concludes with special precautions to be observed when using the alloys LM6 and LM10.

A paper on " Metallurgical Control of Quality in the Production of Aluminium Castings," which Mr. A. V. Carless, A.I.M., is to present to a symposium organized by the Institute of Metals on this subject on May 1, carries a section on melting practice, which in slightly abridged form is reprinted below:—

Aluminium-casting alloys are commonly melted in steel or refractory crucibles, and the first point bearing on the control of quality which requires attention in this operation is the procedure adopted to avoid contamination with iron when steel is used. The choice of crucible material depends on the nature of the alloy and whether the molten metal is to be contained for a comparatively short time, as in the preparation of most sand-foundry melts, or to be held for fairly prolonged periods such as may occur in a die-casting foundry.

In general, alloys of high-silicon or magnesium content are unsuited for use in steel crucibles, however good the protective coating that is applied. Such alloys, which include LM1,2,5,6,9,10,13, and 20, should be melted in refractory (usually plumbago) crucibles. LM11, although it contains neither silicon nor magnesium in significant amounts, is also best melted in plumbago to avoid even the slightest chance of iron pick-up, for the reasons given.

Although certain other alloys for sand-foundry work, such as LM8, 14, and 23, contain magnesium and silicon, these elements are present in rather smaller amounts, and steel crucibles have proved quite satisfactory in practice, provided that the number of consecutive melts between recoatings is strictly limited to a proved degree of safety, usually two such melts. It is advisable, and usually more convenient, to use steel melting pots wherever possible, because they have better thermal properties and, owing to their non-porous nature, there is less likelihood of gas pick-up.

Maintenance

To ensure adequate maintenance of pots, it is well worth while to set up a small specialized department, where duties are the scraping down, cleaning, and recoating of this equipment. Protective washes are usually made from one of the aluminous or magnesia proprietary coatings easily obtainable and mixed with a sodium silicate solution to act as a binder. Ladles, skimmers, and all furnacemen's tools are cleaned daily and treated with this preparation. The coating of plumbago pots is not generally considered essential, but a suitable wash helps to minimize gas absorption and assists in prolonging the life of the crucible, particularly when corrosive fluxes are used, as in the case of LM6 and LM10. With LM10, also, the coating should be as chemically inert as possible, to prevent silicon contamination which might otherwise result from reaction between silica and the magnesium of the alloy. In the case of melts in the die foundry, the use of plumbago crucibles is always advisable, whatever the alloy, owing to the frequently prolonged periods for which molten metal is held.

METAL TREATMENT

Gas Absorption

The second point in dealing with melting practice, and one of great importance in the control of metal quality, is gas absorption and the removal of gas from a melt before casting. Molten aluminium is capable of dissolving considerable quantities, and the effect of such dissolved gas, if it is not removed, is to reduce the mechanical properties, pressure-tightness, and general condition. The effect of the partial escape of gas during the solidification of gassy metal in a sand mould is shown in the characteristic " pin-holing " to be seen on machined faces of castings affected in this way. The appearance is unsightly and unsatisfactory.

Gas absorption (the gas being almost entirely hydrogen derived from moisture and hydrocarbon decomposition) can arise from several sources:

(i) The use of metal which has been badly stored and which has accumulated surface-corrosion products. Naturally, every precaution should be taken against this possibility.

(ii) Pick-up from flame and combustion gases impinging on the metal surface. This is prevented by using an inert-cover flux, many proprietary types of which for use with aluminium alloys are available, and the strict avoidance of forced melting or free flame in contact with the metal charge, particularly when molten.

(iii) Pick-up from melting pots and tools which have not been sufficiently well preheated to destroy every trace of moisture or hydrated material. The adequate preheating of freshly-coated steel pots before recharging is of particular importance.

Assuming proper attention is given to these details, which should be quite easy in routine practice, aluminium-alloy melts are usually of very low gas content. Nevertheless, it is now general practice to apply a degassing treatment to all molten metal used for sand-cast work. For this purpose the metal is raised to 700 to 720 deg. C., under its protective flux layer, heating is reduced, and the melt is stirred with a circular movement to effect a separation of the spent flux, which is skimmed off

as a dry, powdery mass, leaving a clean metal surface. Degassing is effected by plunging into the molten alloy some ⅛ to ¼ wt. per cent. of a proprietary compound based on hexachlorethane, which is usually in tablet form for convenience. The additions are made in portions of one-quarter of the total treatment at a time, so that the effect is regular and controlled. The principle of the treatment is that the degassing compound decomposes in the molten alloy, liberating mainly aluminium chloride vapour, which sweeps out any previously dissolved gas and is itself practically insoluble in molten aluminium.

To ensure that the metal prepared for any sand casting of importance has a sufficiently low gas content, the melt is tested before casting, by the British Non-Ferrous Research Association's reduced-pressure test method. A sample of the metal is baled into a small iron crucible which has previously been heated and " washed " in the melt, and is then transferred to a small autoclave in which the test sample is allowed to solidify under a reduced pressure of some 40 to 20 mm. mercury. A window in the lid of the autoclave allows visual inspection of the freezing sample; unduly high gas contents are immediately evident from the appearance of a swollen, convex surface, caused by the upward pressure of the dissolved gas. Lesser degrees of gassing will show small protuberances, while a really satisfactory sample will show a flat or even concave surface. With a little experience, gas control by this means is both simple and effective.

In the Author's experience, it is unwise to assume that, because an apparently effective melting and degassing treatment has been observed, all melts so treated will automatically follow the same pattern and render gas-testing unnecessary. Gas pick-up can be so insidious that this simple and essentially practical test should be applied to all important melts.

Grain Refinement

The holding of molten aluminium-alloys for considerable periods, especially at elevated temperatures, may harm their casting characteristics and impair the physical properties of the product by causing grain coarsening. In modern practice, therefore, it is usual just before degassing to treat sand-foundry melts with one of the various grain refiners marketed, as much as ½ wt.-per cent. being used in some cases.

Cibula* has shown that grain refinement by such means involves the formation of very small particles of certain compounds, notably carbides or borides, which act as nuclei of crystallization for the aluminium-rich primary crystals. Titanium boride appears to be particularly effective, and the essential elements are usually introduced in the grain-refining preparation as double fluorides of an alkali metal. The preferred grain diameter varies with different alloys, but is usually in the range 0.05 to 0.03 cm., and if undue coarseness be noted in any particular case, special regard is paid to such a batch of castings, especially from the point of view of ensuring representative mechanical properties and of pressure-tightness, if applicable.

After grain refining and the subsequent degassing treatment, the metal should be used as soon as possible and, in the case of an unexpected delay on the moulder's part, the molten metal should be kept at a low temperature and not brought up for treatment at all until the position is clear for progress.

Temperature Control

While some degree of superheating of the melt above the desired casting temperature is obviously necessary to allow for transfer loss, especially in cases where metal has to be baled into casting crucibles, and not cast direct from the melting crucible, it should be as small as possible. The use of unduly high temperatures promotes gas absorption and grain growth, particularly if the soaking time is prolonged. The maximum melt temperature is rarely as high as 800 deg. C. and is generally 50 to 60 deg. C. lower than this. In the case of LM10 and 11, the maximum permitted is 720 deg. C., because these alloys are particularly sensitive to overheating.

Accurate pyrometric control is essential and, apart from portable instruments which may be moved to any desired casting site, fixed instruments with multi-point switching may be used to cover every section of the sand foundry. The instruments should be verified by the pyrometry maintenance staff, who normally check daily 20 per cent. of the instruments in regular use against a potentiometer. In this way, every instrument is checked at least once weekly, and the portable instruments used for the casting temperatures themselves are checked daily.

The casting temperature employed in any given instance is the lowest which will satisfactorily run the casting and give, in practice, a reasonably uniform system of temperature gradation, so that any tendency to drawing at bosses and large changes of section is minimized. If the metal is too hot, this factor may lead to marked segregation and tearing effects. Only experience and trial, having due regard to the size of mould and the alloy used, can indicate the optimum conditions.

Precautions with Particular Alloys

(a) LM6

Two of the alloy series require special attention. The first is the aluminium-silicon alloy LM6. This is unique in that the mechanical properties required in the product depend on a special refinement of the microstructure. This refinement is achieved by " modification," which is effected by the addition of sodium to the melt, the sodium being introduced either in the metallic form or by treating the melt with a salt mixture. This consists of sodium fluoride and chloride, which produces sodium by interaction with the molten metal. The effect of the sodium addition is to suppress the normal crystallization of the aluminium-silicon eutectic and in this way to produce a marked reduction in the particle size

* A. Cibula, *J. Inst. Metals*, 1949-50, **76**, 321.

of the silicon in the cast structure. The resultant metal is tough and ductile.

In practice, the molten alloy is usually first treated with a hexachlorethane tablet, not only to degas, but also to destroy the "residual modification" arising from the use of "modified" ingot or process scrap. The pre-determined amount of sodium (or salt mixture, thoroughly dried) is then applied. The "salts method" of preparation gives melts freer from gas and is generally preferred in the sand foundry, as ordinary commercial sodium salts contain much gas and are usually contaminated with hydroxide, which is also likely to introduce hydrogen.

However, two recent developments may improve this position. The first consists of the introduction of a capsule containing sodium and a degassing agent combined, a procedure which seems unorthodox in theory but is said to be effective in practice. The second is the commercial preparation and use of vacuum-melted sodium, which is virtually gas-free. Both these developments reflect considerable credit on their originators. The use of these sources of metallic sodium for the modification of sand-foundry melts may become more popular because sodium is easier to use than the salts method, a less-critical working temperature may be used, and the erosive action on the plumbago melting pot is negligible as compared with that produced by salts.

The amount of metallic sodium usually required is some 0.05 to 0.10 wt.-per cent., and this is introduced by plunging, using a suitable holding tool. After 5 min. or so has been allowed for the melt to clarify, casting is carried out within a further 15 min., the effect of modification in the molten metal being only temporary. When the salts modification process is used, the temperature must be accurately regulated to that known to give the most consistent results: this is usually 760 deg. C. The time for which the mixture is left in contact with the molten alloy, *i.e.* actual processing time and standing time, is also kept uniform.

The control of correct processing is assessed by fracture tests and mechanical-testing results, and becomes in practice a routine operation. If the general trend of silicon-alloy melts appears to be departing from the accepted standard—this may sometimes arise in a change of supplier's ingot—microscopic examination is resorted to, in order to study the situation more closely.

In die-casting practice, the heavy chill effect imparted by the metal dies is often sufficient to give a good, close structure without the use of sodium, when the castings are of thin section. For castings of heavy section, sodium is used, but in considerably smaller amount than for sand-cast work. In this respect, die-casting practice is less critical, the presence of small amounts of gas in the melt being more tolerable than with sand casting.

(*b*) *LM*10

The second alloy requiring special treatment in the sand foundry is the aluminium—10.5 per cent. magnesium-alloy L53 or LM10. In the first place, the use of the normal protective fluxes suitable for the bulk of aluminium-alloys is excluded, because they are based on sodium silico-fluoride mixtures; this renders them not merely inefficient for use with LM10 but definitely detrimental, as this alloy is harmed by sodium contamination. A proprietary flux based on magnesium chloride is used, and as such mixtures are deliquescent, the preparation is normally fused by the manufacturers and supplied in this condition. The need for keeping fluxes for foundry use in dry condition is particularly important in this case.

The flux is liquid at the metal temperature, 680 deg. C., and after serving its purpose as a cover flux during melting, the heavy flux layer (some 3 per cent. is normally used) is well "washed" into contact with the molten metal to clean up dross. LM10 is not readily degassed and usually requires 0.5 per cent. of degassing tablets added in small regular increments. The reduced-pressure test for gas content is of particular value in this case.

Birmingham Exchange and Engineering Centre

The permanent exhibition of the Birmingham Exchange and Engineering Centre receives a fairly constant stream of 5,000 visitors a month, reported the president, Mr. Victor Brenner, at the annual meeting of the Centre earlier this month. He pointed out that although that figure did not appear high when compared with those recorded at exhibitions of limited duration, the exhibition was a permanent feature and most of those visiting it did so for a specific purpose.

Since the Centre opened in 1954, the number of exhibitors had risen from 207 to 273 and the policy of having a stand at as many foreign trade fairs as possible in order to deal with inquiries for the British engineering industry, had been actively pursued. The number of inquiries received by the information office was also increasing and it was being used more and more as an original source of inquiry. More than 40 technical societies now regarded the Centre as their permanent home and during the past winter it had been open every evening for meetings.

Further Fall in Raw Material Prices

About half the increase in the rise of prices of basic materials which followed the closing of the Suez Canal has been recovered, according to the March index published by the Board of Trade. The index of prices of basic materials used in manufacturing industry (excluding fuel) fell from 159.6 in February to 158.7 in March.

In October (before the canal was closed) the index stood at 155.4 and then rose to the December peak of 161.6.

The fall was mainly attributable to lower prices for, among a number of items, copper, tungsten ore, and zinc.

The index numbers for materials used in mechanical engineering and in the electrical machinery industries fell by 0.6 per cent. and 1.2 per cent., respectively, between February and March, mainly because of declines in the prices of copper and brass products.

The index for prices of all manufactures maintained its fractional but gradual rate of increase in March. It now stands 2.6 per cent. higher than a year ago.

Notes from the Branches

Northampton Section

The most successful event yet organized by the Northampton and district section of the Institute of British Foundrymen, was held on Saturday, March 23, when a party of 45 representing nearly 90 per cent. of the members of the section, visited the Nuneaton foundries of Sterling Metals, Limited. The party was welcomed by Mr. T. Player and had an opportunity of seeing the magnificent new canteen building before dividing into parties for a tour of the foundries.

The new iron foundry, which is not yet completed, must be regarded as likely to be one of the outstanding automobile foundries in the country. It is designed to produce 1,750 cylinder-blocks and 1,500 cylinder-heads per shift. Members were particularly interested in the new water-cooled hot-blast cupolas which are provided with semi-automatic charging, thus enabling two men to charge the metal, coke, and limestone, required for the 200 tons of molten iron which will be required each shift.

Semi-automatic Plant

The semi-automatic moulding plants of the "' station-master " type were examined, and one automatic unit producing cylinder-blocks was seen to be provided with an automatic core-setting and closing section. The sand plant supplying the moulding and core stations is so designed that any quantity of sand of any particular quality may be supplied to individual stations as required. The company uses a wide range of cores and it was seen that while conventional oil-sand was used for some cores, others were made in resin-bonded sand and by the shell process. The party was extremely impressed by the high quality of the cores and moulds, and by the high dimensional accuracy of the castings being produced.

In the light-alloy foundries members saw aeroplane-wheel hubs being cast in magnesium and a very wide variety of special castings used in modern aircraft. Here again considerable progress had been made with shell cores, some of those seen being up to 3 ft. high and 18 in. dia. An outstanding development in this section was the use of plaster cores by the Antioch process, in such applications as the production of automatic gearbox castings.

At the conclusion of the visit the section president, Mr. L. W. Bolton, thanked Mr. W. J. Sully, and the other directors of the company, for the hospitality and for the excellence of the arrangements made for the visit. He also recorded his deep admiration of the courage displayed by the directors of the company in introducing so many innovations in the plant which they had had the pleasure of examining.

South Africa

Sustained interest was shown in the shell-moulding process at the March meeting, in Johannesburg, of the South African branch, when the subject for the evening was " Mechanization for Shell Moulding." By courtesy of the Polygram Shell Mould Company, Limited, a colour film was presented which showed the development of shell moulding from the original hand-investment stage to semi-mechanized, and mechanized, moulding and coremaking machines. The operating procedure of each machine was shown in detail and this was followed by mould closing using an adhesive, to the final pouring of the moulds in the foundry.

At the conclusion of the film, Mr. K. H. Coombs presented a paper in which he also traced the development of shell moulding from the original hand-process to its position to-day. Indicating the progress made in South Africa to date, and commenting on the problems experienced and methods adopted to overcome them, Mr. Coombs said that the development of the shell-mould process had fallen into three distinct phases: (1) The preliminary method of investing a pattern-plate on a dump box and man-handling the plate or corebox to and from a separate oven; (2) the development of multi-station machines with built-in ovens, ejection mechanism, and patternplate handling devices, controlled by an operator, and (3) the development of completely automatic moulding and coremaking machines, where the operator simply removes the ejected shell half-mould or core. According to the Author, the stage (1) development is over; stage (2) has been reached and is being used extensively, and the first machines of stage (3) are now making an appearance. Machines of the automatic type, built in America, have reached an output of 200 complete moulds per hour.

Referring to South Africa, Mr. Coombs said that it should be remembered that the shell-moulding process had been in use in industry for only 10 years as against centuries for conventional methods and, with this in mind, the progress made in four years in South Africa was indeed astonishing. The remainder of the lecture was devoted to a review of equipment available; moulding materials; binders; release agents; methods of moulding, closing, and casting.

Discussion

Mr. S. Cheetham, who was asked by the president, Mr. G. F. Alexander, to open the discussion, *inter alia*, complimented Mr. Coombs on the presentation of his paper and the film. In reply to various points raised by Mr. Cheetham, the Author stated that some of the finest cores yet produced had been obtained from pre-coated sands. He also stated that " build up " on patternplates was being overcome by incorporating a stripping agent in the sand. To overcome distortion encountered when the use of an adhesive necessitated using one hot and one cold shell, Mr. Coombs recommended heating both shells to 60 deg. C. before applying adhesive. Further questions evoked the following answers: Shell-moulding patternplates used in South Africa do not have springs, the ejector pins being tied to a plate, and operated by foot-actuated cams. Patternplates for shell moulding were being produced almost as cheaply as those for green-sand moulding, and one foundry had made a plate for only 50 castings off. At the conclusion of the discussion a hearty vote of thanks was proposed by Mr. Holdsworth.

Site for Proposed RTB Steelworks

Arguments in favour of the siting of the £160,000,000 steelworks planned by Richard Thomas & Baldwins, Limited, in west Wales rather than in Newport (Mon), were put to Mr. Henry Brooke, Minister of Housing and Local Government and Minister for Welsh Affairs, and Sir David Eccles, President of the Board of Trade, last week.

The deputation, which was composed of representatives of local authorities concerned, emphasized the special needs of west Wales. Both Ministers promised to consider the arguments, but it is understood that the President of the Board of Trade pointed out that two considerations must have an important bearing on the eventual decision—the cost of production and transport facilities.

Guidance in Casting Brass and Bronze Test-bars

The Association of Bronze & Brass Founders has just reported the findings of a committee covering the making of test-bars. The report states that the commonly used copper-base alloys, as given in specification BS 1400, can be divided into two groups (excluding the brasses): the aluminium-bronzes and high-tensile brasses which have short solidification-ranges, and the copper/tin alloys which have longer solidification ranges. Test-bars cast in aluminium-bronzes and high-tensile brasses give results which, apart from the influence of dissolved gas and oxide inclusions, reflect the quality of the alloy, as defined by the basic chemical composition, the impurities present and the standard of alloying which has been achieved, and give consistent results. On the other hand, it is well known that test-bars cast in the copper/tin alloys give results which can be considerably scattered from good to bad, even with bars from the identical running system.

High-tensile Brasses and Aluminium-bronzes

The recommended technique for casting test-bars of aluminium-bronzes and high-tensile brasses is straightforward and is as follows:—

Fig. 1 shows the form of the wedge test-piece which is recommended, it is very similar to that shown in BS 1367, the differences being that the neck between the bar and the feeding head is slightly opened and the head dimensions increased.

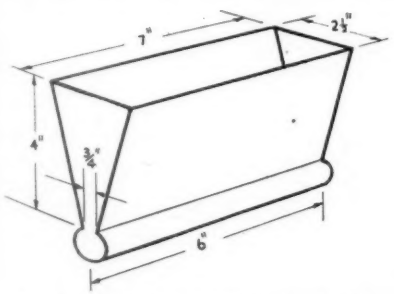


FIG. 1.—*Dimensions of the standard wedge-pattern test-bar for high-tensile brasses and aluminium-bronzes.*

If care be taken to ensure that the metal is clean, and equal care is taken in the pouring process, this bar can be satisfactorily produced by pouring metal into the open head at one end. There is, of course, no objection to the bar being bottom poured, although allowance has to be made for the casting temperature of the actual bar, having regard to the running system employed. The recommended casting temperature for alloy AB2 is 1,220-1,260 deg. C. It is advisable to maintain the aluminium content of the alloy slightly above the middle of the range. Test-bars in high-tensile brass should be cast at about 1,000 deg. C., for the HTB1 alloy, and at about 1,050 deg. C. for HTB2 and 3.

These alloys are sensitive to work-hardening during machining as a result of the use of heavy cuts or blunt tools: the effect of this can be to reduce the elongation value seriously and to reduce the tensile-strength value to a lesser degree. Care should therefore be taken during machining the bars to avoid work-hardening.

Copper/Tin Alloys

Considerable investigation has been carried out, particularly on the gunmetals, by various research workers, in order to obtain consistent test-bar results. Unless consistent results can be obtained

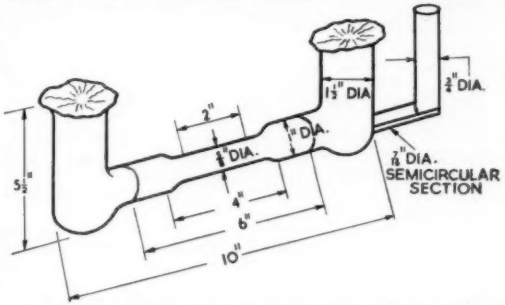


FIG. 2.—*Modified IBF-type cast tensile test-bar showing the central dimensions.*

with bars from one melt, the results are clearly without significance. Results have been published* putting forward the view that it is unreasonable to expect a test-bar to disclose information concerning both the gas content and the quality of the metal with regard to its composition. As the purpose of the test-bar is to reflect the quality of the metal in the ladle or crucible, it is reasonable to take steps to eliminate the influence of gas, and if this can be achieved it is then possible to obtain reasonably consistent results. It has been found that this can best be done by control of macro-structure which necessitates control of the pouring process. There is a research on test-bar methods for these alloys in hand at the British Non-Ferrous Metals Research Association at the moment, but the results will probably not be available for some little time. In the meantime, the following practice is put forward, which has been found to give reasonably consistent results according to the care taken in casting the test-pieces, results which reflect the quality of the metal used. A test-piece of a modified IBF design, with a separate downgate and run through a choke, as shown in Fig. 2 (and in the work to which reference has been made), has been found most suitable. Three of these bars can

* A. R. French, *Proc.* IBF, 1955, 48, B89. also FOUNDRY TRADE JOURNAL, 98, 253, 281, (March 10 and 17, 1955).

Guidance in Casting Test-bars

be moulded in a box and poured separately as indicated. (It is recommended that the reader should refer to the JOURNALS indicated for more complete details of the work on which this technique is based).

In the case of the sand-cast phosphor-bronzes, the influence of mould/metal reaction can be inhibited by the use of a suitable mould dressing which is available from certain of the supply houses.

DSIR Research Report

The latest list of Research Reports issued by the Technical and Documents Unit of the Department of Scientific and Industrial Research includes No. PB.121227 which foundrymen would find particularly useful.

Entitled the "Effect of Geometry on the Properties of 195-T6 and 356-T6 Aluminium-alloy Castings," the study described aims at establishing relationships between the properties of test-bars and the properties which may be expected from aluminium-alloy castings of different geometries. Various sizes of plate, L. T and X section castings were compared with standard $\frac{1}{16}$ in. web Webbert test-bars, poured at the same heats. Experimental procedures are described. Comparisons of tensile strengths, and elongation are presented in detail. Results indicate that for the 356 alloy the average strengths of castings were from 100 to 80 per cent. of the values obtained from separately cast test-bars, as the casting thickness increased from $\frac{1}{4}$ to 2 in. Average elongation was found to be approximately 30 per cent. of that of separately cast test-bars.

The 195 alloy is very sensitive to cooling rates so that tensile strength of castings $\frac{1}{4}$-in. section were found to be 20 per cent. higher than the value obtained from test-bars but in 2-in. sections were 20 per cent. lower. Elongation values of castings ranged from 80 to 30 per cent. of separately cast test-bar valves with variations in casting thickness of $\frac{1}{4}$ to 2 in. The relationships may be improved by using special foundry techniques.

The report, which costs 3s. 9d. as a microfilm and 18s. 9d. as an enlarged print, is obtainable from the Technical Information and Documents Unit of DSIR at Cunard Building, 15, Regent Street, London, S.W.1; payment should not be made at the time of ordering.

Law Case

At Birmingham Assizes on April 9, Mr. Justice Finnemore awarded £713 damages to Mr. Reginald Stanley Betteridge, of Nuneaton, against the Standard Motor Company, Coventry. Mr. Betteridge injured a knee when he slipped while crossing rollers on a moving track at the Banner Lane factory and had to have a cartilage removed. In his judgment Mr. Justice Finnemore said he was satisfied the firm had failed in its duty by not putting up a notice warning workmen of the dangers.

PIG-LEAD (minimum content 99.95 per cent. Pb) production in OEEC producer countries (Austria, Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, the United Kingdom, and Sweden), as well as in Morocco and Tunisia, amounted to 52,070 metric tons in January compared with 44,520 tons in the previous month.

Technical College Libraries

The early appointment of qualified librarians to the technical colleges is recommended by the Minister of Education, Lord Hailsham, as part of the Government's drive to expand technical education. A circular has been issued to local education authorities in which it is recommended that from £500 up to £2,000, according to the size of college, should be set aside as an annual allowance for the purchase of books and periodicals; a minimum of 3,000 volumes being the stock target. Other recommendations deal with accommodation and equipment, including the easy accessibility of librarians; separate reading rooms for books and periodicals; and in a college doing much advanced work, the provision of a small separate room for reading micro-texts. A small workroom for binding and repairs to books and periodicals should also be provided. Where these requirements would mean larger libraries than those laid down in Ministry building bulletins, the Minister would be prepared to give permission for the extra area.

The circular calls for imaginative publicity, both inside and outside the library, to help the part-time student, especially evening students, who frequently fail to realize that the library is an integral part of the college. The Minister concludes: "The maintenance of an adequate library service is comparatively expensive, but the service is essential if students are to be trained to seek up-to-date information, to become independent workers rather than passive recipients of lecture notes.

Changing Industrial Situation

Sir Harold Emmerson, Permanent Secretary to the Ministry of Labour and National Service is to open the three-day conference on the "Changing Industrial Situation" which begins at the Palace Hotel, Buxton, to-day. Organized under the joint auspices of the British Institute of Management, the Institute of Personnel Management and the Personnel Management Advisory Service of the Ministry of Labour and National Service, it has been arranged for directors, general managers and works managers, in selected areas, to discuss human problems and management responsibilities. Subjects to be covered during the conference include "Employment Policies;" "Training Problems;" and "Securing Acceptance of Change." Two speakers are to deal with each of these subjects; they are Mr. D. McConnell and Mr. A. Smith; Mr. D. Brazier-Creagh and Mr. J. A. Hunt, M.B.E.; and Dr. W. L. Patrick and Mr. H. R. Nicholas, O.B.E.

Public Inquiry—Clean Air

In connection with the consideration being given by the Minister of Housing and Local Government to the making of an Order or Orders under Section 4 of the Public Health (Smoke Abatement) Act, 1926, extending the list of works mentioned in the First Schedule to the Alkali, etc., Works Regulation Act, 1906, and the list of noxious or offensive gases mentioned in section 27 of that Act, a public inquiry is to be held in London to hear representations received.

The inquiry will be at Agriculture House, Knightsbridge, S.W.7, on May 27, at 10.30 a.m., and will be conducted by Sir Frederick Armer, with Mr. W. A. Damon as technical assessor. A statement indicating the persons who have made representations and the effect of such representations may be obtained from the Secretary, Ministry of Housing and Local Government, Whitehall, London, S.W.1.

Equipment & Supplies

Knock-out Fume and Dust Removal

Having regard to the general discomfort which frequently prevails in the immediate vicinity of the average foundry knock-out, much thought has been given by the Sturtevant Engineering Company, Limited (Southern House, Cannon Street, London, E.C.4) to the problems involved, and plants have been installed which deal with them quite effectively to the obvious satisfaction of all concerned. The main problem—that of removing dust and fumes—of itself presents no great difficulties; but this comparatively simple operation sets up other conditions which cannot be tolerated and so the problem tends to become a little complicated. The hot, contaminated air in the neighbourhood of the knock-out may be removed by an exhausting fan, but it is immediately replaced by a convergence of cold air from all directions, a condition which is neither healthy nor wise—for silicosis and allied diseases must not be eliminated at the expense of exposing personnel to the risk of pneumonia and its equally unpleasant corollaries. Furthermore, the question of economics in space-heating intrudes, for as is well known, the heating in wintertime of large volumes of air to replace that exhausted can be very expensive.

It was decided therefore, that the solution lay in an extraction/replacement balancing arrangement, whereby the dust and fume contaminants and the air carrying them are removed by an exhauster and the requisite amount of clean replacement air is instantly made available without undue disturbance of the air in the workshop, other than in the immediate space above the knock-out.

In practice, the extraction-hood arrangement is such that fresh air is blown in at points immediately above the suction openings so that the strength of the suction reverses the flow of the cold air and draws it back into the suction openings, thus preventing the escape of fumes from the space directly above the knock-out. At the same time, the volume of air drawn in from the main space of the workshop is very substantially reduced, this contributing to the comfort of operators close to the knock-out by eliminating strong draughts which would normally prevail if only a simple exhausting system were in use.

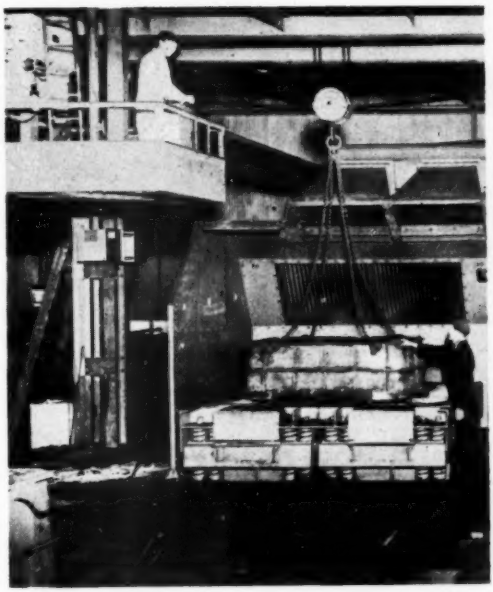


FIG. 1.—*Arrangement of the Sturtevant knock-out hood at Wilsons & Mathiesons' foundry, showing the exhaust grilles, and above them the fresh-air supply grilles.*

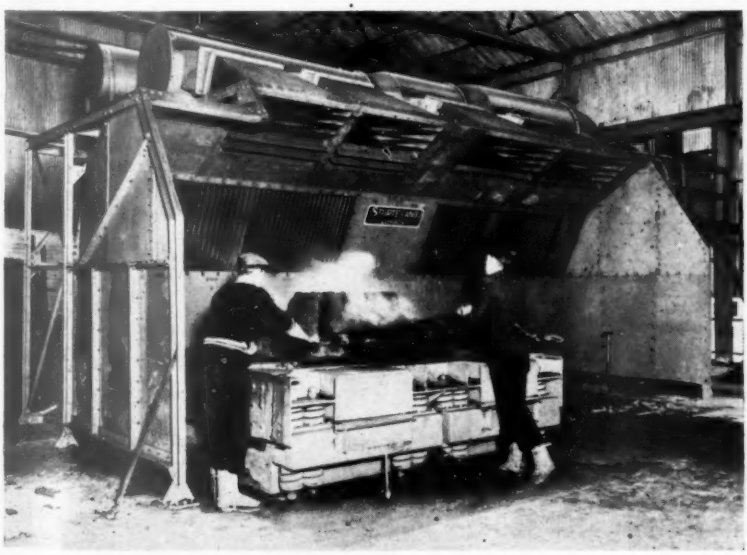


FIG. 2.—*The effectiveness of the exhaust is clearly demonstrated by this illustration. During the knock-out operation, it is claimed that the combined exhaust and fresh-air admittance well controls dust and fume, even that arising from the casting.*

Leeds Installation

An interesting plant of this type is that installed in the new mechanized bath foundry of Wilsons & Mathiesons Limited, Leeds (Figs. 1 and 2) in

Equipment and Supplies

conjunction with a mechanical moulding plant supplied by Foundry Mechanisations (Baillot) Limited, of Bletchley. The hood includes a static knock-out grid at floor level and a 9 by 6 ft. shake-out alongside. During the knock-out operation, the bath casting is rolled out from the drag on to the floor in front of the static grid, when it is some 10 ft. away from the suction opening in the hood. The exhaust is effected by a Sturtevant axial-flow fan 51-in. dia., driven by a 35-h.p. motor and the balancing air is supplied by a second fan of the same type, 45-in. dia, and driven by a 12.5-h.p. motor.

A feature that will be appreciated after study of Fig. 2., is that the rising, contaminated air from the knock-out encounters the descending fresh air from the balancing input, and the path of the exhaust becomes almost horizontal and receding from the operators at a height of about 5 ft. from the floor. The plant is reported to be giving complete satisfaction in that it (*a*) removes dust and fumes in conformity with Foundry Regulations; (*b*) provides adequate fresh-air ventilation; (*c*) introduces clean air, as distinct from replacement air drifting from another part of the shop and possibly itself carrying a dust burden; (*d*) supplies fresh air without draughts, and (*e*) provides sufficient fresh air without undue wastage of heat units in the space-warming system.

FIG. 3.—*Electric hoist, of 1-ton capacity, made by Taylor Stoker Company, Limited, in use for carrying pouring ladles at the Dursley foundry of R. A. Lister & Company, Limited.*

Electric Hoist

Fig. 3 shows an interesting application of electric hoists for handling ladles of molten metal in a foundry. This installation is at the Dursley works of R. A. Lister & Company, Limited, and although it has been in operation for some time this is the first occasion on which an illustration has been available. There are several of these hoists, operating on continuous-loop runways, to pour the moulds which travel on conveyors. The hoists are one- and two-ton capacity Lo-Hed electric hoists, manufactured by Taylor Stoker Company, Limited, 189/191, Drummond Street, London, N.W.1, who also designed and installed the runways and electrification.

It will be noted that the hoist is directly subjected to the intense heat radiated from the ladle of molten metal, and this occurs during the whole operation of conveying each ladle from the cupola to the moulds and while pouring; insulated covers are fitted to provide protection. An important feature claimed for the design of the hoists is the elimination of electrical devices, to minimize the possibility of electrical troubles arising in service. The only electrical components are the motor and the controller—the brakes and the limit switch operate mechanically. Other features are the minimum headroom occupied by the hoist and the robust construction to withstand severe operating conditions. An unusual safety element is an attachment, permanently secured to the middle of the flexible steel wire rope which ensures, that in the event of the rope breaking through accidental damage at any point, the ladle cannot fall. At least half of the rope will remain in position so that the ladle can be safely lowered to the floor; and then the damaged rope can be replaced.

ROY REEMER, LIMITED, 35, New Oxford Street, London, W.C.1, announce a "take-it-yourself" photographic service. Briefly, all the photographic equipment necessary to take a good picture is provided on hire to clients at a nominal charge of £3 3s. a month and the user sends films to be developed and printed by Roy Reemer, Limited, at normal trade terms. (The service also covers the free training in the use of the equipment by any representative of the hirer). Copies of a brochure, describing the scheme, are available to readers on request to New Oxford Street.

American Stainless Alloy

At a meeting of the Technical Research Committee of the Alloy Casting Institute—an Association uniting the activities of the American stainless-steel foundries, Dr. M. G. Fontana, chairman of the Department of Metallurgical Engineering, Ohio State University, described a new cast alloy known as CD-4MCu. This alloy has the following range of composition: 25 to 27 per cent. chromium; 4.75 to 6.0 per cent. nickel; 0.04 per cent. carbon (max); 1.75 to 2.25 per cent. molybdenum: 2.75 to 3.25 per cent. copper; and 1 per cent. each of silicon and manganese (max). With a Brinell hardness of about 300, it shows a tensile strength of 62 tons per sq. in. and a yield strength of 44 tons. It is stated to have excellent corrosion-resisting properties; better machining properties than 18-8 stainless steel; good welding and grinding characteristics; whilst its founding properties include good feeding and fluidity.

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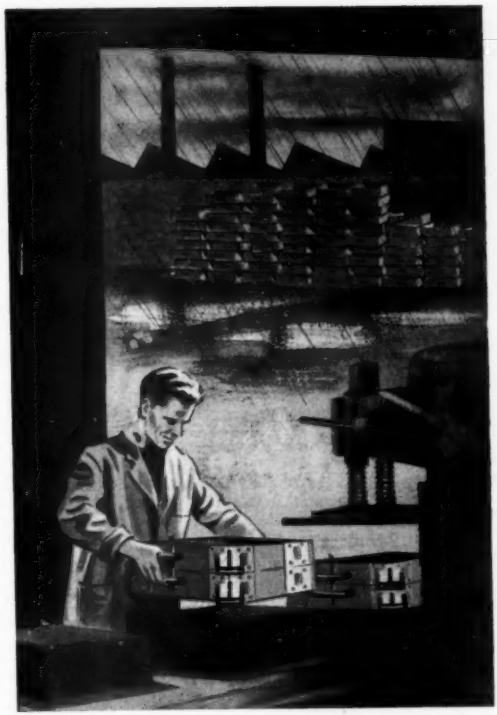

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Company News

CRAVEN BROS. (MANCHESTER), LIMITED, machine-tool makers, etc.—After tax of £43,000 (£135,000), net profit is down to £54,152 (£127,842). A final of 5 per cent. makes 10 per cent. for 1956, compared with a 17½ per cent. total for the previous year.

EDGE TOOL INDUSTRIES, LIMITED—Dividend of 7½ per cent. (same, plus final of 12½ per cent., making 20 per cent.). The next accounts will cover a period of 15 months to September 30, 1957. It is the intention that the financial year will in future end on September 30.

ELKINGTON & COMPANY, LIMITED, hot die stampers, engineers and toolmakers, etc., of Birmingham—Trading profit for 1956 was £39,556, against £105,719 in 1955. The net profit of the company, which is a subsidiary of the Delta Metal Company, Limited, was £13,188 (£33,058). Preference dividend for 27 months to December 31, 1956, £11,644 (nil). Credit forward. £7,196 (debit £75,986).

PATERSON ENGINEERING COMPANY, LIMITED—Following recent discussions the directors anticipate an offer from Portals to purchase all the preference and such of the ordinary shares not already held by a subsidiary of Portals. Holders are advised not to dispose of their shares until the matter has been settled. Should offers be received from Portals, it is likely that details will be sent to members with the accounts for 1956.

BRITISH ALUMINIUM COMPANY, LIMITED—Group manufacturing and trading profits for 1956 were £3,294,439 (£3,248,463) and the net balance after minority interests, £1,493,959 (£1,371,972). The ordinary dividend is 12 per cent. (same on smaller capital). Group net assets expanded from £26,089,503 to £32,927,981, reflecting an increase from £105,702 to £6,584,646 in investments in subsidiaries not consolidated.

CROFTS ENGINEERS (HOLDINGS), LIMITED—Increased producing power and efficiency were the cause of the increase in group profit from £861,173 in 1955 to £1,168,302 in 1956, according to the chairman, Sir Arthur Croft. Speaking of the future, Sir Arthur said that they were ready to deal with a much greater amount of work than ever before. They started 1957 with a good order-book, and this, with their improved delivery position, was a guide to the results they could expect if the demand for their products continued.

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference ESB can be obtained from the Board of Trade Export Services Branch, Lacon House, Theobalds Road, London, W.C.1 (telephone: CHAncery 4411, ext. 738 or 771), unless otherwise stated.

PAKISTAN, May 1—Machine tools and air compressor. (ESB/9873/57.)

SOUTH AFRICA, May 8—Copper ingot, for the South African Railways. (ESB/9606/57.)

URUQUAY, May 3—Cast-steel shoe heads, for motor coaches. Guarantee for offer $100. (ESB/13049/57.)

INDIA, May 1—Moulding boxes for the Director-General of Supplies and Disposals. (ESB/9398/57.)

INDIA, May 10—Moulding machine, hydraulically operated. (ESB/9116/57.)

BURMA, April 29—Air compressors and shot-blast cabinet. (ESB/9715/57.)

THE RECEIPT at the JOURNAL office of large and small editions of a very pretty calendar for 1957 from Allis-Chalmers Manufacturing Company, Wisconsin, USA, is gratefully acknowledged.

New Patents

(Copies of complete specifications are obtainable from the Patent Office, Sales Branch, 25, Southampton Buildings, Chancery Lane, London, W.C.2, price 3s.)

769,528. R. Daub, West Caldwell, Essex, New Jersey, USA.

Piston structures, and in particular, pistons for internal-combustion engines. The patent deals with the method of manufacture of a light-durable piston. A co-patent No. 769,529 deals with a method of manufacture of reinforced piston-ring grooved-surfaces with high heat-conductivity.

769,576. Kabel-und Metallwerke Neumeyer A.G., Klingerhof-strasse, 70-72, Nuremberg, Germany.

The preparation of steel by the continuous-casting process prior to cold deformation.

769,586. Douttan Products Metallurgie, Les Tartarets, Corbeil, Seine et Oise, France.

A method and means for casting ingots in the presence of exothermic material. It consists essentially of laying along at least part of the wall of the ingot mould, a lining of agglomerated exothermic products while leaving a heat-insulating layer (which is at least partly gas-permeable) between at least part of the exothermic lining and the inner wall of the ingot mould.

769,660. Knapp Mills, Inc., 23-15, Borden Avenue, Long Island, City, New York, USA.

A method and apparatus for casting, whereby a mould is adapted to apply a vertical-strip of coating material to a wall, such as coating uncladded welded-seams of lead-lined tanks. The mould bridges a transverse portion of the area to be coated. It has at least one undercut-groove to receive the coating material as it is deposited to form the strip. The material hardening within the groove or grooves forms the guide means for holding the mould in position in guiding it along the path to be coated.

769,719. Georges Lemoine, 28, Alle Dior, Livry-Cargan, (Seine), France, and Rene Loisel, 17, Rue du Pre, Pantin, (Seine), France.

An exothermic composition, particularly for use in casting metals in which a metal chlorate or perchlorate and colloidal clay (such as Fontenay sand, bentonite or china clay) are added to a mixture of aluminium and at least one oxidizing agent.

769,822. General Motors Corporation, Grand Boulevard, Detroit, Michigan, USA.

A high-temperature creep-resistant nickel-brass alloy. It has a typical composition of carbon 0.0 to 0.25, manganese, 0.0 to 1.00, silicon 0.0 to 1.00, chromium 13.00 to 17.00, molybdenum 4.00 to 6.00, titanium 1.50 to 3.00, aluminium 1.00 to 4.00; boron 0.01 to 0.15, iron 0.1 to less than 8.00 per cent. The balance is of nickel.

SHEFFIELD FIRMS were invited to contribute apparatus to the city's new technical college by Alderman Robert Neill, the Lord Mayor, at the luncheon of Sheffield Purchasing Officers' Association on April 11. He said that Sheffield, which was in very good health from an industrial point of view, would reap the benefit of this great project. Mr. S. Moffett, director of education, said the college would not have enough accommodation in ten years' time, and plans were already being made for another building.

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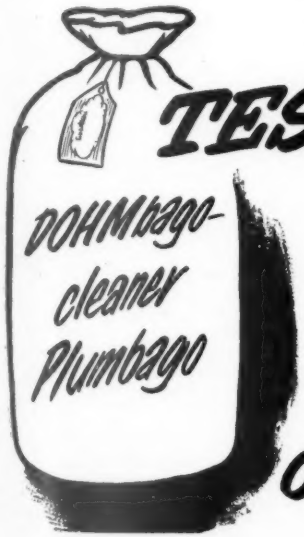

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News in Brief

THE Institute of Directors has celebrated the election of its 25,000th member.

THE 1957 CZECHOSLOVAKIAN ENGINEERING EXHIBITION is to be held at Brno, from September 1 to 22.

MONKS & CRANE, LIMITED, Garretts Green Lane, Sheldon, Birmingham, 33, announce the inauguration of a machine-tool division.

THE PAKISTAN GOVERNMENT has ordered 500 motor-cycles and spares, worth £130,000, from the Triumph Engineering Company, Limited, of Coventry.

THE National Smoke Abatement Society has decided to seek incorporation as a company limited by guarantee and without share capital, and with the new name "National Society for Clear Air."

NEARLY 50 REPRESENTATIVES from 14 countries will be attending an international seminar on the "Nurse in Industry" which is to be opened in London to-day by Mr. Iain Macleod, Minister of Labour and National Service.

1956 WAS A RECORD YEAR for mining in Rhodesia. Southern Rhodesia's mineral output set up a new record of £23,260,000. Northern Rhodesia's output of electrolytic copper passed the 200,000-ton mark for the first time.

BRITISH TRANSPORT DOCKS are to spend £600,000 on the modernization of the quay cranage and ancillary work at their Immingham dock and over £250,000 on improving import facilities for iron-ore traffic at their Barrow docks.

UNIVERSAL PATTERN COMPANY (LONDON), LIMITED, Kelvin Way, Crawley, Sussex, has changed its name to the Universal Pattern and Precision Engineering Company, Limited. The new title better expresses the firm's current activities.

F. PERKINS, LIMITED, Peterborough, has received a further order for 1,300 diesel tractor engines from the Industrija Motora concern in Yugoslavia. The engines, delivery of which starts in May, will be used in the Yugoslav Zadrugar tractor.

Mr. J. MCMULLEN, chief metallurgist of the Electric Resistance Furnace Company, Limited, gave a lecture on electric-furnace applications at the close of a dinner at which the company entertained 150 Midland metallurgists in Birmingham, on April 11.

THE STANDARD for dimensional and constructional requirements for coke-burning inset open-fires without boiler and without convection, B.S.2845:1957 has now been published by the British Standards Institution, 2 Park Street, London, W.1, price 3s. 6d.

Sir CLAUDE D. GIBB, chairman of Reyrolle & Company, Limited, electrical engineering, Hebburn, has reported that the value of orders received last year was substantially higher than in any previous year in the company's history. Output also established a new high record.

MANUFACTURING OPERATIONS are expected to commence at the end of June at the recently acquired portable electric-tool factory at Brockville (Ontario) of the Black & Decker Manufacturing Company, of Toronto. It is the first manufacturing plant to be established by the company in Canada.

THE MAYOR OF WEST BROMWICH, Alderman J. W. Banks, recently opened a new canteen block at the Bank-street foundry of the Sandwell Casting Company, West Bromwich. Adjoining the main premises, it comprises a works canteen which can seat 200 diners, two smaller canteens for directors and staff, and a large, fully-equipped kitchen.

A NEW BLOCK of shower-baths and locker-rooms at the Leeds foundry of Wilsons & Mathiesons, Limited, costing nearly £20,000, were opened last week by a 79-year-old foundry worker, Mr. James Mitchell, who has been on the staff for 65 years. Mr. W. H. Christie, director and general manager, said Mr. Mitchell had been chosen as opener as a gesture of appreciation of his service.

AT THE END OF THIS MONTH David Brown Tractors, Limited, will close their factory at Fagley, near Leeds. It was opened by the firm in 1947 and at one time 550 workers were employed there on the production of tractors and Aston Martin racing cars. In recent months the number of workers has been progressively reduced. The engine division is being transferred to Meltham, near Huddersfield, and the automobile division to Newport Pagnall, in the South Midlands.

ONE OF THE FEATURES of the recent safety campaign within all the steelworks of Richard Thomas & Baldwins, Limited, was the distribution by officers at the various plants, of a book of safety matches to any employee who was seen committing, or about to commit, an unsafe act. Other gimmicks used to help the campaign were the distribution of notebooks bearing the slogan "Please Note—Safety Pays" and blotters urging "Don't have a blot in your department." Mats and ashtrays bearing safety slogans were placed in the canteens.

AFRICAN MALLEABLE FOUNDRIES, LIMITED, Benoni, has recently been given the hallmark of approval of the South African Bureau of Standards for its range of pipe fittings. Fittings manufactured by the firm are subjected to meticulous control at all stages during manufacturing operations. The company recently became associated through its holding company, the First Electric Corporation, with the Associated Electrical Industries of Great Britain. Customers include State departments and appliance manufacturers in the agricultural, mining and industrial fields.

AN AGREEMENT has been concluded between Acrow (Engineers), Limited, and the German Demag group, whereby Acrow will look after Demag interests in Britain. This arrangement is expected to widen considerably Acrow's scope in the field of mechanical handling. A contract, valued at $200,000, for the construction of the travelling formwork to be used for the Beauharnois Lock on the St. Lawrence Seaway project has been given to Acrow (Engineers), Limited. It will be the largest single unit of its type ever to be produced in Britain. The formwork will be required to hold 6,000 tons of concrete.

AN AGREEMENT has been made recently between Keith Blackman, Limited, Mill Mead Road, London, N.17, and Prat-Daniel (Stanmore), Limited, Whitecroft, Nailsworth, Stroud, Glos., by which both companies will be able to offer complete draught equipment for power station and industrial work. In addition an agreement has recently been made with the Aerotec Corporation of America, which has resulted in the introduction of electrostatic precipitators to the range of both companies. Under this arrangement both Keith Blackman, Limited, and Prat-Daniel (Stanmore), Limited, are able to offer with undivided responsibility to boiler makers and users complete mechanical draught and grit-arrester equipment, comprising fans and multitubular dust collectors, which where needed can be supplemented by electrostatic precipitators.

Better-Cheaper-castings! with DOHMfrac PRE-COATED SAND

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More uniformly well finished cores per hour with little casting scrap.

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(3) Investment Base.

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.....

SEE PAGE 519

Personal

Mr. R. MARTIN RAIKES has been appointed managing director of the Fullers' Earth Union, Limited, Redhill, Surrey.

Mr. D. G. STOKES, director and general sales and service manager of Leyland Motors, Limited, has been elected chairman of the heavy vehicle section of the Society of Motor Manufacturers and Traders.

Eighty-seven-year-old Mr. J. LILLY, a past-director of R. Harris (Brassfounders) Limited, Newhall Hill, Birmingham, returned to the company's works on April 10 to present long-service awards to employees.

Mr. H. D. LAWS, secretary of Smith & Wellstood, Limited, ironfounders, Bonnybridge, who left the company to take up an appointment in Liverpool recently, was presented with an electric razor and a brief-case from members of the staff.

THE RT. HON. LORD TEDDER, G.C.B., D.C.L., LL.D., Marshal of the Royal Air Force, and Chancellor of the University of Cambridge, will open the new metallurgical laboratories of the British Welding Research Association at Abington Hall, Abington, near Cambridge, on July 23.

Mr. J. D. HOWDEN HUME, production engineer, and Mr. J. D. YOUNG, secretary, have been appointed directors of James Howden & Company, Limited, engineers, Glasgow. Mr. J. S. A. PEARSON, controller, and Mr. N. ZOLLER, general works manager, have been appointed local directors.

Mr. KENNETH DOCKSEY, of Lloyds (Burton) Limited, and formerly general manager of Parker Foundry (1929) Limited, Derby, has been appointed manager of the London office of the F. H. Lloyd group. He is a past-president of the East Midlands branch of the Institute of British Foundrymen.

LORD HIVES, the guest of honour at the annual dinner of Derby and District Association of the Engineering and Allied Employers National Federation, was presented with an engraved Tutbury crystal salver. The presentation was made by Mr. F. V. Pipe, senior past-president of the Association.

Mr. DAVID PHIPPS, foreman of the machine and fitting shops at the Great Bridge, West Bromwich foundry of James W. Shenton, Limited, was recently presented with a cheque by the directors on completion of 50 years service. Mr. Phipps, who is still working, has been employed by three generations of the Shenton family.

Norton Grinding Wheel Company, Limited, announce that Mr. J. C. EWER will shortly be leaving them to take up a new appointment with the Norton Company, USA. Mr. Ewer, who has been with the organization now for more than 20 years, was transferred to the Norton Grinding Wheel Company in 1950, and was appointed managing director in the following year.

Mr. JOHN GLEN, a member of the research department of Colvilles, Limited, Motherwell, has been awarded the Hadfield medal of the Iron and Steel Institute for 1957. The award is in recognition of Mr. Glen's contribution to the study of the deformation of steel at high temperatures. This has led, it is stated, to a more reliable interpretation of creep data.

Mr. G. A. YOUNG is retiring from executive management and will, therefore, cease to be assistant managing director of Richard Thomas & Baldwins, Limited, but will remain a member of the board. From June 1, Mr. W. F. GILBERTSON will be executive assistant to the managing director, and Mr. CEDRIC T. THOMAS and Mr. CAMPBELL ADAMSON will become general managers of the company's Ebbw Vale and Redbourn sections respectively.

Mr. JOHN LEE, C.A., who retains his present position of secretary, has been appointed a director of Scotts' Shipbuilding & Engineering Company, Limited, Greenock. Mr. JOHN FINNIE (lately manager of the Taikoo Dockyard & Engineering Company of Hong Kong, Limited) has also been appointed a director. Mr. GEORGE HILTON has been appointed deputy managing director in addition to his present position of shipbuilding director.

Dr. J. M. ALEXANDER, of the English Electric Company, Limited, has been appointed to the London University Readership in Plasticity, tenable at the Imperial College of Science and Technology. Mr. E. J. LE FEVRE, senior principal scientific officer and head of the Heat Division of the Mechanical Engineering Research Laboratory at East Kilbride, has been appointed to the university's Readership in Mechanical Engineering, tenable at Queen Mary College.

Obituary

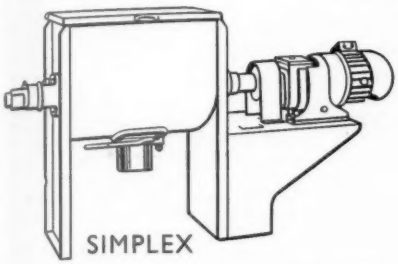
Mr. FRANK HARPER, who for more than 40 years was employed at the Rotherham works of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, and who was Mayor of Rotherham in 1935-36, died on April 15.

The death occurred on April 15 of Mr. PAUL SISON HAM, chairman and managing director of Ham, Baker & Company, Limited, Langley Green, Birmingham, water engineers, which was founded at Westminster by his father in 1894.

The death occurred on April 12 (as the result of a motor accident) of Mr. R. WHALE, who was on the staff of John Miles & Partners (London), Limited, consulting engineers. Born in 1922, Mr. Whale spent six years with Dorman Long & Company, Limited, before going to the Royal Aircraft Establishment at Farnborough. He joined John Miles & Partners in 1948.

Mr. HEDLEY LLOYD, who died suddenly in Oporto, Portugal, during a business trip for his firm, was export director of Marsh Bros. & Company, Limited, Sheffield. He had been associated with the firm for over 50 years and had travelled extensively for the company. Mr. Lloyd, who was 72, was a member of the Export Committee of the Sheffield Chamber of Commerce. In 1955 he was made M.B.E. for his services to British industry.

Major GILBERT DENNISON, a leading figure in the metalware and jewellery trades, died in Birmingham on April 13 at the age of 73. Major Dennison was chairman of the Denbro group of companies. He was a Liveryman of the Worshipful Company of Goldsmiths; a Guardian of Birmingham Assay Office; and held office in a number of jewellery trade organizations. He was a member of the council executive committee of the Federation of British Industries and of the Birmingham Chamber of Commerce. During the last war he held the office of Deputy Regional Commissioner of the Midland region. He was the first owner, it is believed, of the first motor-cycle to be imported into Britain, and during the 1914-18 war he was responsible for making the prototype of the Blimp, a dirigible balloon that played a prominent part in that war.



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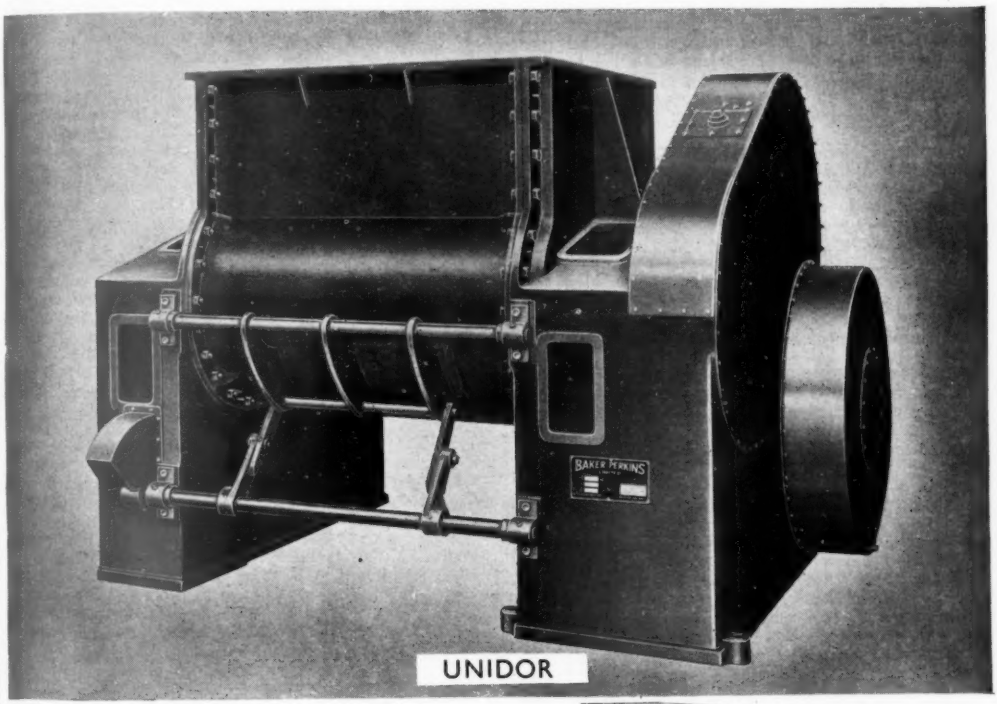

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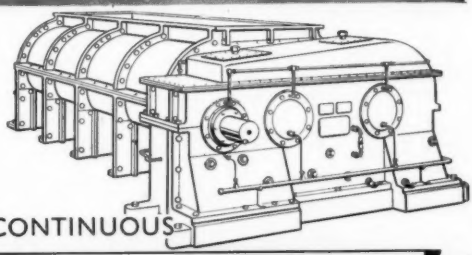
Both "UNIDOR" and "CONTINUOUS" machines subject the sand to perfect milling action between their twin shafted, helical, contra-rotating sigma blades. Other mixers in all sizes are supplied for core sands, pre-coated resin sands and CO_2 mixes.



CONTINUOUS

BAKER PERKINS LIMITED

ENGINEERS

WESTWOOD WORKS · PETERBOROUGH

Raw Material Markets

Iron and Steel

Most of the foundries closed for the Easter holiday and took the opportunity of carrying out minor repairs to plant and cupolas. Deliveries of raw materials were in the main suspended during the holiday as there were sufficient supplies of pig-iron, scrap, coke, etc., on hand to enable foundries to restart.

Pig-iron output in March of 277,200 tons a week constitutes a record, and gives an annual rate of over 14,000,000 tons—the target figure for the year. Practically the whole of the increase in production consists of basic pig-iron for the steelworks from the fresh blast furnaces recently blown in and the reconstructed larger capacity units. Ore deliveries from home and abroad are maintained at good levels, and while they are satisfactory in quantity the grades and qualities are not always in keeping with requirements, particularly in the lower phosphorus ranges, which are not too plentiful.

Outputs of high-duty castings at the engineering and speciality foundries maintain good levels with some increase in production of castings from the foundries which supply to the motor vehicle trades. Demands for low-phosphorus pig-irons and hematite have shown some increase which producers have had no difficulty in satisfying. Present usage of these irons is, however, much below the potential consumption of these foundries and also the quantities which they were taking up some months ago. Refined irons are in good supply and makers can accept much more business.

Many of the light foundries are still very slack and little if any improvement in their prospects can be foreseen, as they continue to be affected adversely by economic conditions in the supply of domestic equipment, etc. Builders' castings, apart from gutters and pipes, are also only called for moderately. Plentiful supplies of high-phosphorus pig-iron are available and most producers are having difficulty in disposing of all their outputs. Apart from hematite pig-iron, which is not being exported, parcels of other grades are available for export, but merchants who are receiving many calls for supplies from overseas are having difficulty in obtaining licences.

Foundry coke deliveries are satisfactory and in keeping with requirements. Deliveries of scrap are also satisfactory, as well as ganister, limestone, and firebricks.

The re-rollers continue to obtain fairly good outputs of their products with the orders on hand. There is, however, a shrinkage on present demands for small bars and light sections (apart from reinforcing bars) from both stockists and consumers. Strip re-rollers continue to receive improved demands from the motor-car industry.

Supplies of billets from home steelworks continue to be received at the improved levels and generally are sufficient for consumption requirements, although increased tonnages of the smaller sized billets, and carbon and special quality steels are called for.

Non-ferrous Metals

Non-ferrous metal markets continue dull. Fluctuations are small and what business is being transacted is of a routine nature with consumers still drawing on their stocks. This situation is partly due to second thoughts on the Budget, which did nothing to give industry as a whole any kind of lift, and partly due to the see-saw political situation in the Middle East.

Copper is reasonably steady, the deterioration of the political situation in the Middle East being offset by the settlement of the strike at El Teniente and the increase in UK stocks which has raised the contango to between £1 and £1 10s. per ton. In the United States trading activity fell sharply in front of the holidays and custom smelters lowered their quotation to 31 cents per pound. Copper for export was also affected and was on offer at 30¼ cents. Primary producers, however, are maintaining their price at 32 cents per pound. It is understood that the El Teniente strike has been settled most satisfactorily and no further troubles are expected from that quarter in the foreseeable future.

Tin has been a reasonably active market on both sides of the Atlantic. In London the backwardation has closed to around £5 a ton, although this has not been matched by any sharp increase in warehouse stocks. US demand for Straits tin has shown an improvement and the price is once more up to the $1.00 per pound level. US consumption in January showed an encouraging increase of 700 long tons to 8,000 tons compared with the preceding month. Moreover, US stocks are declining and with less metal afloat any sudden increase in demand could push the price up over £800 a ton. Of particular interest was the report issued by the US Bureau of Mines showing that the use of tin in tinplate in 1956 rose in the United States to 34,900 tons from 33,700 tons in 1955.

The feature of the UK market for lead is the reappearance of the contango, indicating thereby more plentiful supplies. This is thought to be the result of the metal sold by the Board of Trade. Trading on the London Metal Exchange has only been fair. According to the British Bureau of Non-ferrous Metals Statistics, stocks of lead in the UK during February dropped to 36,900 long tons, compared with 41,433 tons. In the US quiet conditions prevail, with the price steady at 16 cents per pound.

Zinc is a better market in the UK than in New York. Barter transactions have helped the European position, which is fairly tight for spot supplies. This is reflected by the widening backwardation, which is now around £4 a ton. This has helped coax out a little more metal from Russia and Poland, but not sufficient to weaken the price. In the US demand is erratic and tending to go weaker rather than stronger. Unless and until the US Government makes it clear what it intends to do concerning the stockpiling of the metal this year it is difficult to see the market recovering. The price is still 13½ cents per pound, East St. Louis.

Forthcoming Events

APRIL 30

Institute of Metals

Metal Physics Committee:—Discussion: "Metal Physics of Corrosion and Oxidation," 2.30 p.m., at Church House, Great Smith Street, London, S.W.1.

MAY 1

Combustion Engineering Association

North Western section:—"Comparison of Conventional Space-heating Systems," by J. R. Kell, 10.30 a.m., at the Engineers' Club, Albert Square, Manchester.

MAY 2

Leeds Metallurgical Society

"Some Aspects of Creep," by J. D. Meakin, B.Sc., 7.15 p.m., at the large Chemistry Theatre, The University, Leeds.

Institute of Vitreous Enamellers

Midland section:—"Development of Enamels," by W. A. Ball, 7.30 p.m., at the Birmingham Exchange and Engineering Centre, Stephenson Place.

MAY 3

Institute of British Foundrymen

East Midlands branch:—Annual dinner/dance at the Assembly Rooms, Derby.

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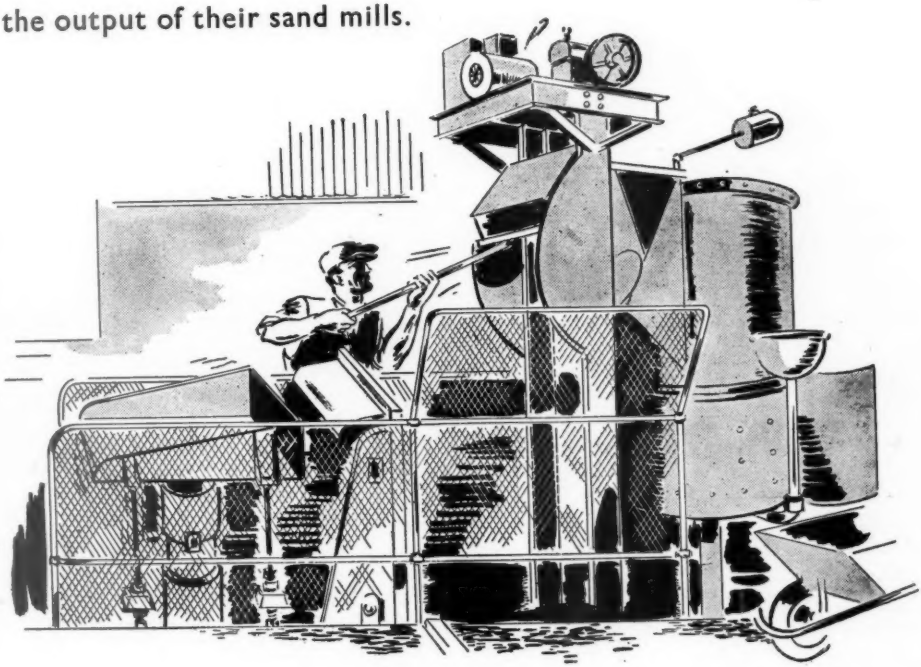

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THE FULLERS' EARTH UNION LTD.

Patteson Court, Nutfield Road, Redhill, Surrey

Telephone: REDHILL 3521

CMF 13

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

April 24, 1957

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2:—Middlesbrough, £20 1s. 0d.; Birmingham, £19 13s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £21 18s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £22 2s. 3d.

Scotch Iron.—No. 3 foundry, £23 4s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £24 6s. 6d.; South Zone, £24 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.—North Zone, £25 14s. 0d.; South Zone, £25 16s. 6d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.:—N.-E. of England (local iron), £22 17s. 6d.; Scotland (Scotch iron), Zone S. 1, £23 4s. 0d.; Sheffield, £24 4s. 6d.; Birmingham, £24 12s. 0d.; Wales (Welsh iron), £22 17s. 6d.

Basic Pig-iron.—£19 3s. 0d. all districts.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £50 0s. 0d. to £53 5s. 0d., scale 17s. 0d. to 17s. 6d. per unit; 75 per cent. Si, £70 0s. 0d. to £76 7s. 6d., scale 17s. 0d. to 17s. 6d. per unit.

Ferro-vanadium.—50/60 per cent., 28s. 6d. per lb. of V.

Ferro-molybdenum.—65/75 per cent., carbon-free, 12s. 3d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., carbon-free, £250 0s. 0d.; 38/40 per cent., £299 0s. 0d.

Ferro-tungsten.—80/85 per cent., 12s. 2d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 15s. 2d. per lb. of W.

Ferro-chrome (6-10 ton lots).—4/6 per cent. C, £96 0s.0d. to £99 10s. 0d., basis 60 per cent. Cr, scale 33s. 0d. per unit; over 6 per cent. C, £94 0s. 0d., basis 60 per cent. Cr, scale 31s. 0d. to 33s. 0d. per unit; 2 per cent. C,* 2s. 2d. per lb. Cr.; 1 per cent. C,* 2s. 2½d. per lb. Cr; 0.15 per cent. C,* 2s. 3d. to 2s. 3½d. per lb. Cr; 0.10 per cent. C,* 2s. 3½d. to 2s. 3¾d. per lb. Cr; 0.06 per cent. C,* 2s. 3¾d. to 2s. 4d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 7s. 0d. to 7s. 6d. per lb.

Metallic Manganese.—90/92 per cent., carbon-free, £290 0s. 0d.; 96/98 per cent., £310 0s. 0d.

Ferro-columbium.—65/75 per cent. Nb + Ta, 22s. 0d. to 23s. 0d. per lb., Nb + Ta.

Ferro-manganese (home).—78 per cent., £82 12s. 6d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., £30 9s. 0d.; tested, 0.08 to 0.25 per cent. C, £31 9s. 0d.; hard (0.41 to 0.60 per cent. C), £32 10s. 6d.; silico-manganese, £41 0s. 0d.; free-cutting, £34 13s. 0d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £38 4s. 6d.; silico-manganese, £41 7s. 6d.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.25 per cent. C, £36 3s. 6d.; basic, hard, over 0.41 up to 0.60 per cent. C, £37 6s. 0d.; acid, up to 0.25 per cent. C, £40 7s. 6d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £39 2s. 0d.; boiler plates (N.-E. Coast), £41 12s. 0d.; floor plates (N.-E. Coast), £40 11s. 0d.; sectional material, N.-E. Coast, £37 11s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., untested (4-ton lots), £37 18s. 0d.; flats, 5 in. wide and under (4-ton lots), £37 18s. 0d.; hoop and strip, £37 17s. 6d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £41 6s. 0d.; black sheets (hand mill), 17/20 g., £52 4s. 6d.; galvanized corrugated sheets, 24 g., £65 9s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £65 10s. 3d.; nickel-chrome, £92 13s. 0d.; nickel-chrome-molybdenum, £104 11s. 6d.

NON-FERROUS METALS

Copper.—Cash, £239 5s. 0d. to £239 10s. 0d.; three months, £240 10s. 0d. to £240 15s. 0d.; settlement, £239 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3¾d. per lb.; rods, 272s. 9d. per cwt. basis; 20 s.w.g., 306s. 0d. per cwt.

Tin.—Cash, £774 0s. 0d. to £775 0s. 0d.; three months, £771 0s. 0d. to £771 10s. 0d.; settlement, £775 0s. 0d.

Lead (Refined Pig).—Second half April, £110 15s. 0d. to £111 0s. 0d.; second half July, £111 0s. 0d. to £111 5s. 0d.

Zinc.—Second half April, £99 0s. 0d. to £99 5s. 0d.; second half July, £95 0s. 0d. to £95 5s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £131 0s. 0d.; rolled zinc (boiler plates), all English destinations, £128 15s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £105.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11¼d. per lb.; rods, drawn, 2s. 11d.; sheets to 10 w.g., 206s. 6d. per cwt.; wire, 2s. 8¾d.; rolled metal, 211s. 3d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £178; B6 (85/15), — ; BS249, —.

Brass (High Tensile).—BS1400, HTB1 (30 tons), — ; HTB2 (38 tons), — ; HTB3 (48 tons), —.

Gunmetal.—BS1400, LG2 (85/5/5/5), £234; LG3 (86/7/5/2), £246; G1 (88/10/2/¼), £300; (88/10/2/1), — .

Phosphor Bronze.—BS1400, PB1 (AID released), — per ton.

Phosphor Bronze Strip, etc.—Strip, 297s. 3d. per cwt.; sheets to 10 w.g., 290s. 0d. per cwt.; wire, 4s. 0d. per lb.; rods, 3s. 4½d.; tubes, 3s. 4½d.; chill cast bars: solids 3s. 4d., cored 3s. 5d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide x 0.056, 3s. 10d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 2¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 1¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 5½d. per lb. Antimony, English, 99 per cent., £210 0s. 0d. Quicksilver, ex-warehouse, £86 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £197 0s. 0d.; aluminium bronze (BS1400), AB1, — ; AB2, — .

* Average 68-70 per cent.